

BD + 1°1522 (HV 11110).—AN INTERESTING NEW VARIABLE STAR

Sergei Gaposchkin*

The peculiar nature of the spectral variations of BD + 1°1522¹ (1850: 6^h 40^m 50^s 7; +1° 22' 5; 9^m 0) suggests the possibility that this star may also be a variable in brightness. Photographs of the region, made at various dates, are available in the Harvard plate collection, and from them I have made estimates of the brightness of the star. The magnitudes were determined in relation to the Harvard Standard Region C4,² where photographic and photovisual sequences, which are assumed to be close to the International System, have been determined by the author. The photovisual sequence has already been published (Gaposchkin, 1939), while the photographic one is in the process of being completed. The results of my magnitude estimates are given in Table I and exhibited graphically in Figure 1. The great majority of the plates employed were taken with the Harvard AC and AM telescopes, which show consistent color equations. Those estimates derived from plates obtained with the AX and AY cameras, which are less constant in their behavior when the exposure time or the tilt of the plate varies, are denoted in Table I by the symbols AX and AY. The exposure time of most of the plates is of the order of one hour, but results derived from plates with exposures much longer than one hour have been indicated in Table I by an asterisk.

TABLE I

The photographic observation of BD. + 1° 1522

J. D.	Mag. (Ipg.)	J. D.	Mag. (Ipg.)	J. D.	Mag. (Ipg.)	J. D.	Mag. (Ipg.)
2,400,000+		2,400,000+		2,400,000+		2,400,000+	
14,666.64	10m57	16,165.59	10.68	17,275.58	10.85	19,009.77	10.12
914.82	10.68	199.51	10.68	471.80	10.57	015.73	10.23
925.87	10.91	387.85	10.57	473.85	10.51	028.72	10.34
927.83	10.80	412.89	10.62	491.87	10.46	054.64	10.12
928.88	10.84	433.76	10.68	484.89	10.57	055.64	10.46
964.79	10.80	438.76	10.68	521.82	10.23	327.83	10.40
982.79	10.68	444.78	10.62	525.72	10.40	334.86	10.57
983.81	10.74	473.71	10.62	615.62	10.34	335.79	10.68
994.75	10.74	494.71	10.80	642.55	10.51	370.78	10.12
15,009.77	10.68	521.53	10.57	865.88	10.23	415.67	10.40
023.69	10.68	548.60	10.68	908.69	10.23	415.72	10.23
069.62	10.68	549.61	10.80	908.69	10.46	629.89	10.34
095.74	10.80	556.52	10.80	938.74	10.46	709.85	10.46
325.86	10.91	573.53	10.62	944.70	10.46	737.78	10.57
337.74	10.74	743.83	10.46	968.63	10.57	751.74	10.68
347.73	10.85	769.86	10.74	979.59	10.46	753.73	10.46
382.65	10.91	785.74	10.62	980.59	10.46	769.70	10.57
383.73	10.80	789.78	10.62	18,004.54	10.34	796.64	10.46
423.59	10.85	792.82	10.68	025.53	10.57	800.62	10.46
426.54	10.68	793.82	10.68	033.53	10.68	811.56	10.46
437.49	10.91	794.76	10.62	089.48	10.46	824.55	10.57
437.60	10.85	810.76	10.51	207.88	10.51	839.51	10.80
451.57	10.80	818.76	10.68	247.87	10.57	20,092.82	10.57
467.56	10.80	819.	10.51	278.63	10.46:	111.73	10.46
652.88	10.91	828.75	10.57	299.72	10.46	122.73	10.51
654.83	10.68	850.69	10.68	308.67	10.40	155.63	10.57
661.89	10.80	856.70	10.62	346.61	10.46	161.61	10.68
679.78	10.80	872.62	10.74	363.51	10.34	178.	10.34
693.85	10.91	876.68	10.80	378.53	10.57:	205.54	10.57
723.72	10.91	880.63	10.80	383.52	10.46	457.79	10.23
724.75	10.91	902.60	10.62	384.50	10.62	460.78	10.34
753.69	10.80	911.57	10.62	386.52	10.57	465.75	10.57
791.63	10.85	922.54	10.68	395.52	10.61	488.74	10.46
815.58	10.96	928.56	10.74	404.68	—	547.59	10.46
819.59	10.91	17,098.87	10.68	575.84	10.28	564.56	10.34
16,015.84	10.85	116.86	10.68	598.85	10.46	576.53	10.40
019.83	10.91	123.80	10.80:	605.79	10.40	600.53	10.57
032.83	10.80	140.89	10.62	615.85	10.51	611.48	10.34
047.83	11.14	148.88	10.62	630.82	10.51	621.47	10.57
053.78	10.91	160.84	10.68	633.82	10.57	755.85	10.40
054.85	10.80	177.88	10.57	659.72	10.42	775.85	10.68
061.82	10.80	198.77	10.68	679.	10.46	787.86	10.51
078.70	10.85	212.73	10.62	717.71	10.46	809.88	10.46
080.80	10.68	238.63	10.57	961.86	10.57	815.77	10.46
145.63	10.68	241.61	10.62	973.86	10.34	815.80	10.46
158.58	10.57	259.59	10.62	983.81	10.46	843.71	10.34
163.66	10.80	270.55	10.68	987.83	10.40	847.73	10.34

* Harvard College Observatory.

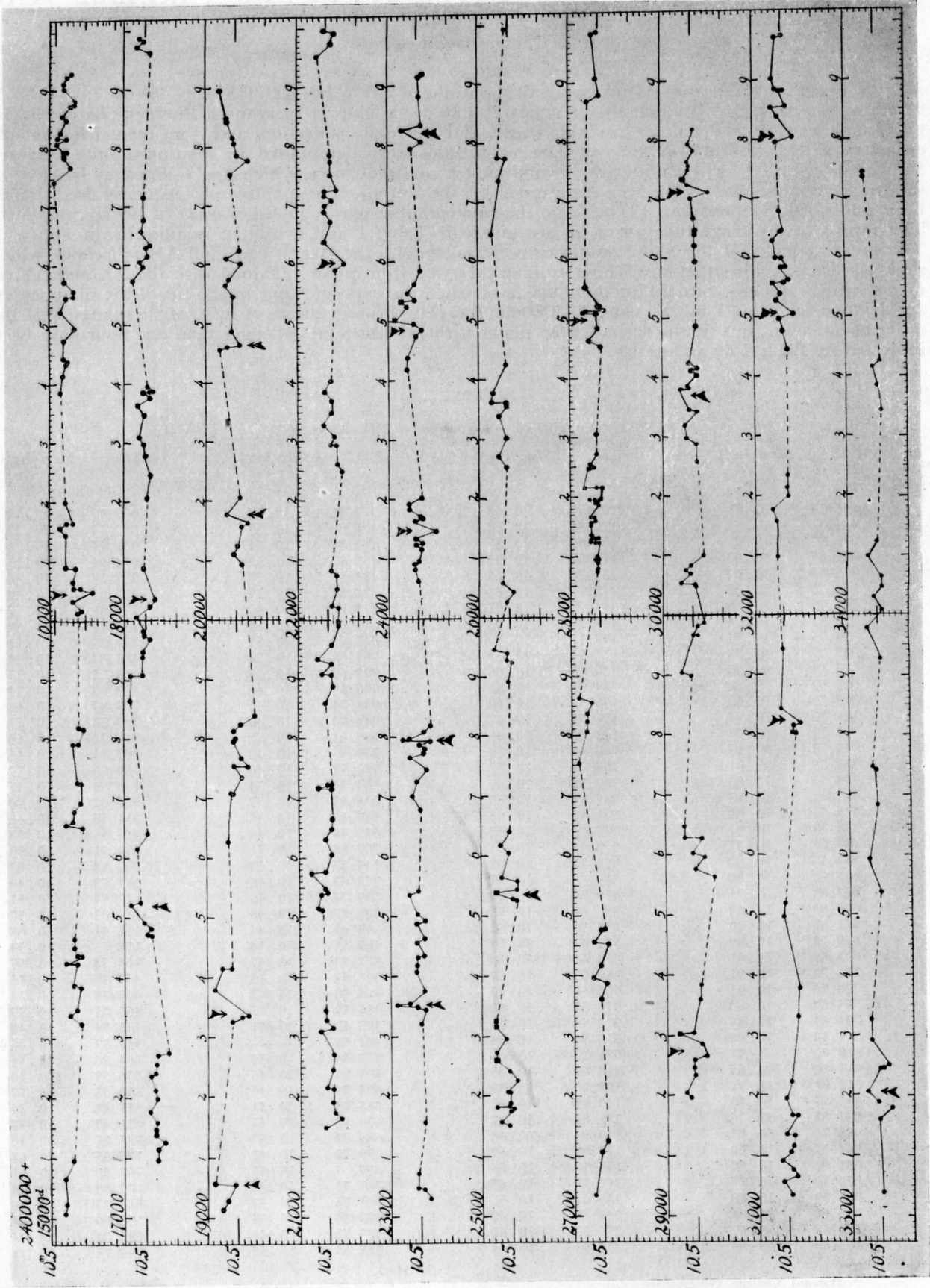


Fig. 1.—The magnitude variation of BD + 1° 1522.

TABLE I (continues)

J. D.	Mag. (Ipg.)	J. D.	Mag. (Ipg.)	J. D.	Mag. (Ipg.)	J. D.	Mag. (Ipg.)
2,400,000+		2,400,000+		2,400,000+		2,400,000+	
20,897.58	10.23	23,346.80	10.57	25,292.34	10.23:AX	28,197.41	10.46
21,148.85	10.46:	350.87	10.46	298.52	10.40	197.60	10.40
165.79	10.68	351.88	10.12	316.27	10.23 AX*	197.64	10.46
173.90	10.57	356.76	10.34	329.56	10.23 AX*	217.56	10.46
190.84	10.57	375.75	10.57	527.84	10.57	217.61	10.23*
212.67	10.57	408.67	10.46	530.59	10.51 AX	218.37	10.51
217.73	10.46	418.61	10.46:	540.69	10.23 AX*	240.32	10.34
245.68	10.57	433.69	10.46	545.79	10.57	241.53	10.40
270.60	10.57	436.71	10.57	560.85	10.57	253.31	10.34
310.56	10.34	458.58	10.46	562.79	10.34	273.23	10.46
318.52	10.57	467.58	10.57	603.75	10.46	307.21	10.46
328.53	10.46	487.55	10.46	616.67	10.34	454.87	10.51
340.54	10.46	493.51	10.57	642.60	10.46	464.86	10.34
513.86	10.40	505.57	10.46	894.71	10.46	483.81	10.46
516.87	10.34	536.49	10.34	925.81	10.51	508.70	10.46
538.77	10.40	543.50	10.46	926.79	10.46	510.72	10.23*
540.80	10.46	677.84	10.51	940.83	10.46	511.68	10.23
546.77	10.46	700.84	10.40	946.78	10.23	516.72	10.57
573.74	10.23	726.83	10.46	26,025.65	10.46	517.78	10.57
578.71	10.46	744.73	10.62	040.58	10.57	520.70	10.46
606.73	10.57	768.65	10.34	055.53	10.40	551.73	10.28
630.60	10.46	771.70	10.57	252.82	10.46	868.79	10.34
646.63	10.57	782.65	10.57	271.81	10.34	879.70	10.51
664.57	10.57	787.66	10.51	304.80	10.46	908.64	10.46
715.49	10.57	794.68	10.68	340.67	10.34	982.54	10.40
716.47	10.34	796.71	10.34:	356.71	10.46	985.55	10.46
722.47	10.51	810.61	10.57 AX	360.69	10.46	29,198.84	10.40
723.17	10.57	818.62	10.68	362.68	10.23	203.79	10.34
858.88	10.46	24,065.88	10.51 AY	377.61	10.23	234.77	10.46
888.86	10.57	084.84	10.46 AY	424.53	10.46	248.75	10.46
905.78	10.40	086.84	10.46 AX	646.85	10.23:	261.66	10.46
905.88	10.57	094.85	10.51 AY	737.62	10.34	267.44	10.68*
923.75	10.57:	113.79	10.57 AY	739.52	10.34	285.63	10.57
924.82	10.34	120.70	10.46 AX	772.58	10.46	306.59	10.23*
953.69	10.57:	124.80	10.57 AY	775.53	10.34	307.54	10.46
990.69	10.68	134.70	10.46	993.90	10.46	360.26	10.57
995.62	10.68	146.62	10.80	27,034.78	10.34	385.23	10.57
22,017.56	10.68	165.67	10.57 AY	107.60	10.46	562.46	10.80
021.58	10.57	166.62	10.46 AX	127.56	10.57	576.80	10.51
050.56	10.68	167.70	10.57	360.90	10.46	599.53	10.68
073.51	10.68	181.60	10.34	387.82	10.57	601.75	10.46
081.47	10.57	196.62	10.34 AX	397.55	10.34	628.74	10.62
249.90	10.74	202.65	10.57:AY	417.71	10.46	629.69	10.34
260.86	10.68	419.87	10.34 AY	453.61	10.57	698.56	10.34
293.81	10.68	437.88	10.34	455.66	10.34	900.86	10.46
295.81	10.57	474.88	10.46	475.59	10.46	903.56	10.34
307.79	10.62	483.75	10.57	477.58	10.51	967.80	10.57
327.74	10.46	494.66	10.46 AX	753.86	10.12	968.38	10.51
349.71	10.57	504.67	10.12 AX*	807.64	10.23*	982.86	10.57
366.56	10.57	524.61	10.34 AX	833.58	10.23*	987.73	10.68
381.58	10.46	531.61	10.23 AX*	838.63	10.23*	30,050.18	10.51
402.57	10.57	535.62	10.46 AY	855.52	10.34	050.55	10.51
589.88	10.68	549.61	10.34 AX	865.56	10.12	053.55	10.34
599.82	10.80	563.62	10.46 AY	28,075.87	10.46	070.34	10.46
637.92	10.46	584.61	10.57	079.86	10.46	076.29	10.40
671.71	10.57	795.86	10.40 AY	091.89	10.46	085.27	10.46
687.69	10.46	802.89	10.57 AY	092.90	10.46	100.23	10.68
693.69	10.46	824.84	10.34 AY	096.86	10.46	259.84	10.57
707.71	10.57	831.85	10.57 AY	100.85	10.46	289.84	10.57
716.70	10.46	889.61	10.51	125.78	10.40	299.75	10.40
721.66	10.46	912.59	10.51 AY	125.86	10.34	320.81	10.40
725.52	10.68	916.60	10.57 AY	125.87	10.40	344.66	10.57
750.63	10.57	25,154.68	10.46:AY	129.54	10.34	345.72	10.46
771.56	10.57	159.78	10.34 AY	131.79	10.46	381.58	10.34
782.52	10.57	176.52	10.46 AY	131.83	10.40	382.72	10.46
951.85	10.34	180.81	10.51 AY	136.79	10.34	384.57	10.46
975.81	10.57	183.79	10.23 AX	156.49	10.34	401.52	10.57
991.80	10.62	183.87	10.46 AY	158.72	10.34	411.57	10.46
999.79	10.46	189.82	10.46 AY	158.76	10.46	416.62	10.57
23,030.79	10.68	208.82	10.46 AY	161.71	10.40	427.63	10.46
044.69	10.57	209.55	10.46	165.67	10.40	483.59	10.57
045.69	10.46	229.72	10.57 AY	165.71	10.34	593.58	10.57
071.60	10.46	244.43	10.46 AX	188.62	10.46	620.61	10.57
155.53	10.57	262.42	10.34 AX*	188.66	10.46	640.64	10.57
320.86	10.51	273.36	10.34 AX	194.42	10.34	642.88	10.57

TABLE I (continues)

J.D.	Mag. (Ipg.)	J.D.	Mag. (Ipg.)	J.D.	Mag. (Ipg.)	J.D.	Mag. (Ipg.)
2,400,000+		2,400,000+		2,400,000+		2,400,000+	
30,667.82	10.51	31,330.56	10.68	32,581.64	10.46	33,250.	10.62
700.78	10.51	378.88	10.68	584.61	10.51	290.	10.34
710.74	10.80	495.70	10.46	596.45	10.40	326.59	10.34
724.76	10.46 AX	519.60	10.46	597.61	10.46	537.	10.51
732.66	10.40*	801.20	10.68	620.63	10.34	591.83	10.34
751.64	10.46	802.14	10.62*	643.65	10.46	683.61	10.46
758.64	10.46	814.72	10.62	676.63	10.46	740.62	10.46
761.67	10.46	817.71	10.74	795.64	10.40	743.49	10.40
781.63	10.57	843.63	10.40	804.70	10.68	929.87	10.51
783.56	10.57	943.68	10.46	838.72	10.46	979.75	10.34
793.58	10.46	32,098.64	10.40	851.58	10.34	34,008.84	10.57
819.55	10.51	157.71	10.40	857.	10.57	028.61	10.46
31,033.78	10.57	173.68	10.34*	880.	10.46	044.72	10.57
056.83	10.40	200.62	10.57	880.65	10.51	063.70	10.57
064.77	10.62	213.59	10.57	880.70	10.40	099.	10.34
077.72	10.57	235.65	10.57	909.	10.34	120.74	10.46
080.71	10.40	447.70	10.57	975.	10.40	341.81	10.57
106.61	10.51	476.65	10.51	979.	10.51	385.84	10.51
114.61	10.57	499.67	10.46	33,038.	10.51	415.78	10.46
134.60	10.57	504.70	10.68	158.72	10.46	424.65	10.57
136.57	10.46	528.72	10.40	177.84	10.68:	738.67	10.34
165.61	10.57	538.74	10.26	185.	10.46	743.68	10.34
166.56	10.68	557.68	10.34 AX*	205.70	10.28		
194.55	10.46	559.73	10.51	241.	10.57		
221.57	10.57	564.69	10.57	244.69	10.46		

Inspection of Figure 1 immediately reveals the occurrence of several unmistakable sudden variations in brightness of the star. It is not possible to estimate the amplitude or duration of the variations, on account of the long exposure times. But the general nature of such variations leads us to infer that the star under consideration exhibits the characteristics of "flare" stars, in agreement with the evidence provided by spectroscopic observations.

We may summarize the mean photometric characteristics of the star as follows:

Apparent magnitude	{Pg	10 ^m 42
	}Pv	9.52
Color Index		0.90 ± 0 ^m 07
Apparent amplitude of variation	{Pg	0 ^m 66
	}Pv	0.3

Because of its earlier spectral type, and because it exhibits higher apparent brightness than do other known "flare" stars, this object deserves the attention of photometric observers who may follow it with small instruments.

REFERENCES

- 1.—See this Bulletin page 36.
- 2.—HA 108, N^o 1, 1939.