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CATALOGUE OF VARIABLE STARS,

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Thirteen years have passed since the appearance of SCHÖNFELD'S *Second Catalogue of Variable Stars*. A work that shall represent the knowledge of to-day as that did the knowledge of its date is an urgent need of this branch of astronomy. The attainment of the same thoroughness of construction as for the catalogue of 1875 would require that it should emanate from the same hand: for any other to undertake the task might seem presumptuous, were the need not so immediate. I shall not apologize, therefore, for the attempt to meet the emergency partially, by the present catalogue, premising that it is to be regarded as a preliminary publication, the defects of which are to be remedied in a subsequent edition, when the series of observations and definitive investigations now in hand shall be completed.

This catalogue is not a mere compilation; otherwise it would scarcely be worth while to add to the number of lists which have appeared from time to time, constructed on the easy method of copying bodily the data of SCHÖNFELD'S work, with additions engrafted thereupon which, sometimes at least, do not suggest a high degree of emulation of the conscientious and critical care of construction typical of the original work.

The preparation of the present work involved, as the first step, the collection of all the published observations of the known variables since their discovery, including the unpublished results of my own observations, which relate, at one time or another, nearly to the whole list of variables visible in this latitude. It is the more or less complete discussion of this material which has, in general, furnished the values of the elements of the light-variations assigned in the catalogue. Where the results of other investigators have been adopted, they have been scrupulously accredited, as hereinafter described.

In the eleventh and twelfth columns of the catalogue are given the maximum and minimum brightness, with their previously observed extremes, derived from a scrutiny of the data so collated, and expressed in the prevailing scale of magnitude, namely, that of the *Uranometria Nova*, the *Durchmusterung*, the *Uranometria Argentina*, and the *Southern Durchmusterung*. Where the data unavailable to SCHÖNFELD afforded no good reason for varying the limits given in his catalogue, the latter were retained unaltered, an asterisk being affixed thereto, to indicate this fact.

The elements in the thirteenth, fourteenth and fifteenth columns, namely, the principal epochs of minimum and maximum and the periods, together with the terms depending on the higher powers, or on periodic functions of the time, in the column of remarks, are the results of original investigation in all cases where an asterisk or dagger is not affixed to the period, in the fifteenth column. The asterisk denotes that SCHÖNFELD'S elements have been adopted, either from his catalogue, or from his subsequent determinations; a course which I have followed whenever it was manifest, upon examination, that no essential improvement could be obtained from the observations now at hand, or that the time required for the calculation of new elements would too long delay the publication of the present edition of this catalogue. Similarly, a dagger is affixed wherever the elements depend on any other authority, quoted in the column of remarks.

Lest it might appear that there are exceptions to the truth of the above statement, and that there are numerous cases in which credit is not here given, it is necessary to say that the list of variables published by Professor PICKERING in 1884, and reprinted from year to year, was simply copied from my catalogue in one of its earlier stages. The manuscript for this, prepared for my private use, I lent to him with permission to employ it as he pleased, disclaiming, however, responsibility for the manner in which it appeared. This accounts for the fact that many of the elements here given for the variables discovered since 1875 are identical with values which have already appeared elsewhere, but are not here distinguished by a dagger.

The results of my investigations upon the elements here incorporated are of very different orders of approximation to what may be considered the best attainable numerical values. Sometimes they were reached simply by comparing the observations since 1875, or thereabouts, with Schönfeld's elements, and finding the new epoch from the mean of these corrections, and the new period from the comparison of this with his epoch. In a far larger number of instances, however, the discussion was of a more elaborate character, partaking of the nature of a definitive computation in many cases. I have already printed, in various places, the details of some of these determinations, and shall do the same for others as opportunity serves. I hope to be able, within a year or so, to issue a second edition of this catalogue which shall contain final elements of all the known variables, and which shall also be more precise and complete in other respects.

An analysis of the catalogue shows that, of the two hundred and twenty-five stars comprised in it, one hundred and sixty are distinctly periodic. In twelve others the periodic character is rather uncertainly defined. Fourteen are distinctly irregular, that is, are either not periodic or follow highly complicated and totally unrecognizable laws. Twelve belong to the so-called *Novae*, or have been seen at only one appearance. In regard to the remaining twenty-seven, little or nothing is known of the character of the fluctuations, the stars having been very little observed. Of the one hundred and sixty periodical variables I have been able to assign in the catalogue both maximum and minimum epochs for sixty-three stars: maximum epochs alone, for eighty-two; minimum epochs alone, for fourteen, nine of these being of the *Algol*-type; while in one the period alone is given.

The elements of one hundred and twenty-four stars are the results of my own investigations; for twenty-two I have adopted those of Schönfeld, and for fourteen those of Argelander, Gould, Parkhurst, or others, after independent examination had shown that the data at hand would not give essentially improved values.

In about one-quarter of the whole number of periodical variables for which elements are given, I have found distinct evidence of systematic departure from uniformity of period. In more than a score of these instances the deviations have a character sufficiently pronounced to enable me to develop the numerical values of the constants of periodic or secular terms, with greater or less certainty; and these functions of the epoch have been inserted in the catalogue, either in the column containing the periods or in the remarks, as the convenience of the available space served.

It is of interest to recapitulate the present state of our knowledge in respect to these curious perturbations, the development of which is so important for the study of the causes of stellar variation. I have therefore collected in the following table, by what seems to be the most perspicuous form of statement, the inequalities incorporated in the elements of the catalogue. The arrangement is in order of the length of the period in the third column, which, with its variation in the fourth column, are the values of the first and second derivatives, respectively, of the elements of the catalogue; and therefore correspond to the instant of the beginning of the epoch E, reckoned from the zero of the principal epoch of maximum or minimum of the catalogue.

No.	Star	Period	Variation of Period	A = Eθ + G θ	G
		d d	d	°	°
4826	R Hydrae	496.91+6.043 cos A	—0.453 sin A	4.3	353.7
		—0.461 E	—0.461		
		—0.004 E^2	—0.008 E		
8600	R Cassiopeae	429.00+6.423 cos A	—1.793 sin A	16.0	346.0
7120	χ Cygni	406.04+0.011 E	+0.011		
8512	R Aquarii	387.16+6.110 cos A	—1.066 sin A	10.0	235.0
8290	R Pegasi	378.10+0.340 E	+0.340		
3477	R Leonis min.	373.50—0.066 E	—0.066		
5501	S Serpentis	365.25+4.801 cos A	—0.419 sin A	5.0	30.0
5677	R Serpentis	357.60+3.927 cos A	—0.343 sin A	5.0	15.0
2946	R Cancri	352.81+0.414 E	+0.414		
6849	R Aquilae	352.30—0.800 E	—0.800		
806	*o* Ceti	331.34+1.555 cos A	—0.037 sin A	1.36	179.8
		+1.210 cos A	—0.043 sin A	2.05	70.1
		+1.296 cos A	—0.093 sin A	4.09	31.25
7220	S Cygni	323.30—0.134 E	—0.134		
5770	R Herculis	318.40+4.189 cos A	—0.877 sin A	12.0	324.0
6044	S Herculis	309.00+7.201 cos A	—0.943 sin A	7.5	100.0
3825	R Ursae Maj.	305.40—0.150 E	—0.150		
4557	S Ursae Maj.	223.92+0.204 E	+0.204		
3994	S Leonis	184.95+0.260 E	+0.260		
6512	T Herculis	164.75+0.628 cos A	—0.079 sin A	7.2	57.6
4521	R Virginis	145.63+0.545 cos A	—0.024 sin A	2.5	135.0
		+0.353 cos A	—0.028 sin A	5.0	65.0
7560	R Vulpeculae	136.90+1.396 cos A	—0.097 sin A	4.0	90.0

No.	Star	Period	Variation of Period	A = Eθ + G	
				θ	G
		d h m s	s	°	°
6758	β Lyrae	12 21 46 58.3			
		+0.8434 E	+0.8434		
		—0.0002 E^2	—0.0003 E		
1090	β Persei	2 20 48 55.425			
		+3.6296 cos A	—0.0012 sin A	0.02	202.5
		+1.4137 cos A	—0.0018 sin A	0.075	203.25
		+0.6109 cos A	—0.0018 sin A	0.167	90.13
6189	U Ophiuchi	0 20 7 41.600			
		—0.0004 E	—0.0004		

Besides the stars in the foregoing table, I have detected distinct evidence of similar systematic inequalities, but without attempting to determine the mathematical expressions of them, in the following cases: *S Cassiopeae*, *R Arietis*, *R Tauri*, *V Tauri*, *R Leporis*, *R Aurigae*, *R Canis minoris*, *S Canis minoris*, *R Leonis*, *R Corvi*, *T Ursae Majoris*, *S Virginis*, *R Scorpii*, *U Herculis*, *T Delphini*, *T Pegasi;* besides the well known case of *R Scuti*. And it is appropriate to add here that there are puzzling discordances between the minima of the *Algol*-type variable *Y Cygni* observed in different years, for which I can see at present no explanation.

The fact that a large proportion of the variable stars are more or less red attracted attention early in the history of the subject; and that some sort of connection between color and variability really exists is now commonly accepted, although the nature of the relation is not at all understood. It seems proper, therefore, that a statement of the degree of redness, expressed in some convenient, although arbitrary, numerical scale, should find place in a catalogue of these objects. In the tenth column I have attempted to do this as well as the material furnished by my observations will permit. In 1883 and 1884 I made a series of about one thousand estimates, by two independent methods, upon about one hundred and twenty of the telescopic periodical variables, directed to this special end. Being a continuous series, made with the same instrument ($6\frac{1}{4}$-inch Clacey equatorial), they have a homogeneity which fits them to serve as a basis of classification of the variables as to redness, until something better can be provided. The details of this investigation will soon be published. The results are given in the tenth column in the figures not in parentheses. The redness is expressed to tenths of a degree of an arbitrary decimal scale, the zero of which corresponds to white light, and the other limit, ten, to the most intense shade of red of which we have cognizance in the heavens, exemplified by such stars as *S Cephei*, *V Cygni* and *R Leporis*. As nearly as the intermediate degrees of this imaginary scale can be verbally defined, 1 corresponds to the slightest perceptible admixture of yellow with the white; 2 to a yellow; 3 to yellowish orange; 4 to a full orange or orange-red; and 5 to 10 to increasing shades of intensity up to the limit described. The results are stated to tenths of the unit, not to imply that they possess by any means that order of accuracy, but simply as the casual average of the estimates. The values for the stars not included in this series are in parentheses; and are merely rude attempts to assign their redness in the same scale, from estimates made at other times, or, where these were wanting, from descriptions by other observers. Two remarks should be added; first, that my scale was formed independently of, and without reference to Schmidt's, and that I am not now prepared to define the relation between the two; and secondly, that I am fully aware how vague and defective this method, of estimate by reference to an arbitrary imaginary scale, is. But it is at least a beginning, if a rude one. The whole subject is beset with great difficulties, and needs thorough study by correct methods.

The places of the stars of Schönfeld's catalogue were taken directly therefrom (correcting a misprint in *η Geminorum*), and those of the additional stars from the most trustworthy available sources. The equinox of 1855 is retained, as it is still, on the whole, the most convenient. On the right hand page, however, are approximate places for 1900, which equinox will be adopted as the fundamental one in some future edition, and which has been made the basis of the method of numbering about to be described.

In the outside columns of both the right and left hand pages is the number of the star, upon a system of ordinal notation designed to remedy the inconveniences attending the usual current numbers. The variables are increasing so rapidly in number that successive editions of catalogues must in future succeed each other more frequently than in the past, to serve the convenience of astronomers. A new current number with each list necessitates a reference column, for identification, of the numbers of some preceding one; or, if the numbers of any one list are retained, the interpolated stars require a suffix-letter, resulting in a hybrid notation which is exceedingly objectionable, and which sooner or later has to be re-formed; when the whole process of degeneration, with its awkwardness and confusion, begins anew. It seems certainly better to adopt a system which attaches a permanent numeral to each star, and which permits interpolation to a practically unlimited extent. I would accordingly suggest that the numbers for variable star catalogues be

(*Continued on page 92.*)

No.	Sch.	Star	1855.0 R.A.	1855.0 Decl.	Annual Variation		Discoverer	Date	Redness	Magnitude Max.	Magnitude Min.
			h m s	° ′	s	′					
100		T Ceti	0 14 26	—20 51.8	+3.04	+0.33	Chandler	1881	(4)	5.1– 5.3	6.4– 7.0
107	1	T Cassiopeae	15 25	+54 59.3	3.20	0.33	Krueger	1870	7.3	7.0– 8.0	11.0–11.2*
112	2	R Andromedae	16 25	+37 46.4	3.14	0.33	Argelander	1858	5.0	5.6– 8.6*	<12.8 *
114	3	S Ceti	16 41	—10 7.9	3.05	0.33	Borrelly	1872	2.0	7.0– 8.0*	<12.5
116	4	B Cassiopeae	16 47	+63 20.6	3.27	0.33	Tycho Brahe	1572		>1 *	? *
161	5	T Piscium	24 29	+13 48.0	3.11	0.33	Luther	1855	(0)	9.5–10.2*	10.5–11.0*
209	6	α Cassiopeae	32 18	+55 44.5	3.36	0.33	Birt	1831	(5)	2.2 *	2.8 *
224		Andromedae	34 49	+40 28.3	3.25	0.33	Hartwig	1885	(5)	7	0?
243		U Cassiopeae	38 16	+47 27.8	3.31	0.33	Espin	1887	(6)	8½?	14?
320		U Cephei	0 49 39	+81 5.6	4.90	0.33	Ceraski	1880	(0)	7.1	9.2
432	7	S Cassiopeae	1 9 4	+71 50.8	4.30	0.32	Argelander	1861	6.7	6.7– 8.6	<13.5
434	8	S Piscium	10 0	+ 8 9.9	3.12	0.32	Hind	1851	1.0	8.2– 9.3	13.5?
466		U Piscium	15 18	+12 6.4	3.16	0.32	Peters	1880		10	<14
494		R Sculptoris	20 17	—33 17.8	2.77	0.31	Gould	1872?	(9)	5¾	7¾
513	9	R Piscium	23 10	+ 2 7.9	3.09	0.31	Hind	1850	2.0	7– 8.8	<12.5 *
715	10	S Arietis	1 56 51	+11 49.7	3.21	0.29	Peters	1865	(2)	9.1– 9.8*	14?
782	11	R Arietis	2 7 53	+24 22.8	3.39	0.28	Argelander	1857	1.8	7.6– 9.0	11.7–13.0
793		T Persei	9 0	+58 16.7	4.23	0.28	Safarik	1882	(4)	8.2	9.3
806	12	o Ceti	12 1	— 3 38.3	3.02	0.28	Fabricius	1596	5.9	1.7– 5.0*	8– 9.5
814	13	S Persei	12 29	+57 55.2	4.24	0.28	Krueger	1873	5.0	8.5	12.5
845	14	R Ceti	18 38	— 0 50.1	3.06	0.28	Argelander	1866	2.4	7.5– 8.8	13.5
893		U Ceti	26 45	—13 47.2	2.88	0.27	Sawyer	1885	(3)	6.8– 7.3	10.5<
976	15	T Arietis	40 15	+16 54.1	3.33	0.26	Auwers	1870	3.2	7.9– 8.6	9.3– 9.7
1072	16	ρ Persei	55 54	+38 16.5	3.81	0.24	Schmidt	1854	(2)	3.4 *	4.2 *
1090	17	β Persei	2 58 45	+40 23.6	3.87	0.24	Montanari / Goodricke	1669 / 1782	(0)	2.3	3.5
1222	18	R Persei	3 20 50	+35 10.1	3.79	0.21	Schönfeld	1861	2.3	7.7– 9.2	13.5
1411	19	λ Tauri	3 52 39	+12 4.6	3.31	0.18	Baxendell	1848	(0)	3.4 *	4.2 *
1537	20	T Tauri	4 13 33	+19 11.3	3.49	0.15	Hind	1861	(0)	9.2–11.5*	12.8–<13.5
1574		W Tauri	19 43	+15 46.5	3.41	0.14	Espin	1886	(5)	9?	<12½
1577	21	R Tauri	20 21	+ 9 50.1	3.28	0.14	Hind	1849	4.5	7.4– 9.0*	13.5
1582	22	S Tauri	21 16	+ 9 37.3	3.28	0.14	Oudemans	1855	2.5	9.5–10.0	<13.5
1654		R Doradus	35 5	—62 21.8	0.69	0.12	Gould	1874?	(7)	5½	6¾
1717	23	V Tauri	43 39	+17 17.4	3.46	0.11	Auwers	1871	3.3	8.3– 9.0*	<13.5
1761	24	R Orionis	51 8	+ 7 54 3	3.25	0.10	Hind	1848	4.4	8.7– 9.1	<13 *
1768	25	ε Aurigae	51 34	+43 36.2	4.29	0.10	Fritsch	1821	(1)	3.0 *	4.5 *
1771	26	R Leporis	4 53 0	—15 1.7	2.73	0.10	Schmidt	1855	9.4	6– 7 *	8.5? *
1855	27	R Aurigae	5 5 36	+53 25.0	4.82	0.08	At Bonn	1862	6.5	6.5– 7.8	12.5–12.7*
1923		S Aurigae	17 33	+34 2.1	3.96	0.06	Dunér	1881	6.7	9.4–11.0	<14.5
1944	28	S Orionis	21 51	— 4 48.7	2.96	0.06	Webb	1870	6.4	8.3– 9.5	13.0
1961	29	δ Orionis	24 36	— 0 24.6	3.06	0.05	J. Herschel	1834	(0)	2.2? *	2.7 *
1986		T Orionis	28 43	— 5 34.5	2.94	0.05	Bond	1863	(0)	9.7	13
2100		U Orionis	47 13	+20 8.7	3.56	0.02	Gore	1885	(7)	6.4– 7.5	<12
2098	30	α Orionis	5 47 19	+ 7 22.9	3.25	+0.02	J. Herschel	1840	(6)	1 *	1.4 *
2213	31	η Geminorum	6 6 8	+22 32.6	3.62	—0.01	Schmidt	1865	(3)	3.2 *	3.7– 4.2*
2266		V Monocerotis	15 25	— 2 7.6	3.02	0.02	Schönfeld	1883	3.4	6.9	10.7<
2279	32	T Monocerotis	17 24	+ 7 9.7	3.24	0.03	Gould	1871	(2)	5.8– 6.4	7.4– 8.2
2362	33	R Monocerotis	31 15	+ 8 51.7	3.28	0.05	Schmidt	1861	(0)	9.5 *	13
2375	34	S Monocerotis	33 0	+10 1.5	3.31	0.05	Winnecke	1867	(2)	4.9 *	5.4 *
2478	35	R Lyncis	49 20	+55 31.6	4.97	0.07	Krueger	1874	4.8	7.8– 8.0	<13
2509	36	ζ Geminorum	55 30	+20 46.7	3.56	0.08	Schmidt	1847	(2)	3.7 *	4.5 *
2528	37	R Geminorum	6 58 37	+22 55.4	3.62	0.08	Hind	1848	5.7	6.6– 7.8	<13.5
2539	38	R Canis min.	7 0 44	+10 14.9	3.30	0.09	At Bonn	1855	5.5	7.2– 7.9*	9.5–10.0*
2583		L_2 Puppis	9 7	—44 24.2	1.82	0.10	Gould	1872	(8)	3.5	6.3
2610		R Canis Maj.	12 55	—16 7.6	2.70	0.10	Sawyer	1887	(0)	5.9	6.7
2625		V Geminorum	15 2	+13 21.9	3.37	0.11	Baxendell	1880	2.8	8.2– 9.1	12.0–14.0
2676	39	U Monocerotis	23 53	— 9 28.6	2.86	0.12	Gould	1873	(3)	5.9– 7.3	6.6– 8.0
2684		S Canis min.	7 24 51	+ 8 37.4	+3.26	—0.12	Hind	1856	4.1	7.2– 8.0*	<11 *

Greenwich Mean Time Min.	Greenwich Mean Time Max.	Period, etc.	Remarks	1900.0 R.A.	1900.0 Decl.	No.
d h m	d h m	d h m s		h m	° ′	
. . . .	. . . .	65 ?	Irregular; possibly, type of R Scuti	0 16.7	—20 37	100
83 Dec. 8	84 Aug. 10	+441 E		17.8	+55 14	107
. . . .	82 Oct. 22.9	+411.2 E		18.8	+38 1	112
. . . .	88 Nov. 13	+322.5 E		19.0	— 9 53	114
. . . .	. . . .	. . . .	Nova	19.2	+63 35	116
. . . .	. . . .	. . . .	Irregular	26.8	+14 3	161
. . . .	. . . .	. . . .	Irregular. Argel. found per. 79d	34.8	+55 59	209
. . . .	. . . .	. . . .	Nova in Andromeda Nebula	37.2	+40 43	224
. . . .	. . . .	. . . .		40.5	+47 43	243
88 Jan. 2 23 20.0	. . . .	+ 2 11 49 45.0 E	Algol-type	0 53.4	+81 20	320
. . . .	88 Apr. 27.5	+607.5 E	I think period is shortening	1 12.3	+72 5	432
. . . .	88 Mar. 31.7	+406.0 E		12.3	+ 8 24	434
. . . .	85 Sept.	+352 E †	Elements uncertain; Parkhurst	17.7	+12 21	466
72 Aug. 21 ?	72 Dec. 7 ?	+207 E	Elements inferred from Cordoba obser. Sawyer has confirmed variability	22.4	—33 4	494
. . . .	81 Dec. 24.0	+344.0 E		25.5	+ 2 22	513
. . . .	72 Mar. 14.0	+290.0 E		1 59.2	+12 3	715
81 Sept. 27.6	82 Jan. 6.5	+186.7 E	I suspect a shortening of period	2 10.4	+24 35	782
. . . .	. . . .	. . . .	Light-curve irregular	12.2	+58 29	793
66 Aug. 8	66 Nov. 25.47	+331.3363 E+ †	{+18d .16 sin(45/11° E+ 31° 15′) +33 .90 sin(45/22° E+ 70 5) +65 .31 sin(15/11° E+ 179 48) Argel. elements, omitting 10-year term	14.3	— 3 26	806
. . . .	73 Nov. 30	+346 E		15.7	+58 8	814
. . . .	70 Oct. 31.4	+167.1 E *		20.9	— 0 38	845
. . . .	84 Dec. 11	+233 E		28.9	—13 35	893
72 Nov. 8	73 Mar. 11	+324 E *		42.7	+17 6	976
. . . .	. . . .	33	Schmidt's period. Schoenfeld thinks the var. irregular	2 58.7	+38 27	1072
88 Jan. 3 7 21 29.23	. . . .	+ 2 20 48 55.425 E′+	{+173m .3 sin(1/50 E′+202° 30′) + 18 .0 sin(5/40 E′+203 15) + 3 .5 sin(1/6 E′+ 90 20); where E′ = E − 11210	3 1.6	+40 34	1090
. . . .	82 June 20.0	+210.4 E		23.7	+35 20	1222
87 Dec. 6 11 57.0	. . . .	+ 3 22 52 12.0 E	Algol-type: period subject to marked inequalities	3 55.1	+12 12	1411
. . . .	. . . .	. . . .	Irregular	4 16.2	+19 18	1537
. . . .	. . . .	. . . .		22.3	+15 53	1574
. . . .	81 Nov. 26.9	+325.0 E		22.8	+ 9 56	1577
. . . .	83 Oct. 25	+376 E	Elements uncertain	23.7	+ 9 44	1582
. . . .	. . . .	. . . .		35.6	—62 16	1654
. . . .	83 Nov. 7	+169.2 E	I suspect variation from uniform period	46.2	+17 22	1717
. . . .	69 Oct. 18.6	+378.8 E *		53.6	+ 7 59	1761
. . . .	. . . .	. . . .	Irregular	54.8	+43 41	1768
79 Jan. 24	79 Sept. 13.0	+436.1 E	Evidence of inequality in period	4 55.0	—14 57	1771
77 May 25	78 Jan. 6.0	+460.6 E	Period probably irregular	5 9.2	+53 29	1855
. . . .	. . . .	. . . .	I think period is certainly over 400 days, but very irregular; possibly with secondary phases	20.5	+34 5	1923
69 July 1	70 Jan. 17	+416 E	Possibly a secondary max. midway	24.1	— 4 46	1944
. . . .	. . . .	. . . .	{Auwers found a 16d period; Schoenfeld found a slight variation, but no period. My obsns. and Sawyer's show no fluctuation of light	26.9	— 0 22	1961
. . . .	. . . .	. . . .	In Great Nebula; Schmidt's obsns. and mine confirm variabiity	30.9	— 5 32	1986
. . . .	85 Dec. 15	+359.5 E †	Duner's elements	49.9	+20 10	2100
. . . .	. . . .	. . . .	Argelander found period 196 days. Schoenfeld thinks periodicity questionable	5 49.7	+ 7 23	2098
70 April 7	. . . .	+229.1 E *		6 8.8	+22 32	2213
. . . .	84 Jan. 1	+334 E		17.7	— 2 9	2266
85 Mar. 24.88	85 Apr. 1.81	+ 27.0037 E	Limits of mags. from Sawyer's obsns.	19.8	+ 7 8	2279
. . . .	. . . .	. . . .	Irregular; in southerly end of the nebular h (399)	33.7	+ 8 49	2362
70 Feb. 2 10.4 ?	70 Jan. 31 19.9 ?	+ 3 10 38 E? †	Winnecke's elements; Schoenfeld's obsns. partly confirm such a period, partly contradict it	35.8	+ 9 59	2375
83 Aug. 20	84 Jan. 26	+380.0 E	Elements uncertain	53.1	+55 29	2478
87 Dec. 29 14 5.7	88 Jan. 3 14 27.7	+ 10 3 41.5 E	{W. M. Reed's obsns. indicate a correction to Schoenfeld's period of —1m 48s, Yendell's one of about —30s. I have adopted —1m 22s	6 58.2	+20 43	2509
78 Jan. 0	78 Apr. 18.0	+370.5 E		7 1.3	+22 52	2528
76 Apr. 28	76 Aug. 20	+337.5 E	There is evidence of inequality of period	3.2	+10 11	2539
78 Jan. 4	78 Mar. 16.0	+136.05 E †	Williams's elements of max.; min. inferred from Gould's remarks in U.A.	10.5	—44 29	2583
87 Mar. 26 14 58.5	. . . .	+ 1 3 15 55 E	Algol-type	14.9	—16 12	2610
79 Sept. 24	80 Feb. 7	+276.0 E	{Limits of mag. from Sawyer's obsns., which show light-curve resembling R Scuti; Yendell's obsns. confirm	17.6	+13 17	2625
73 Apr. 1.0	73 Apr. 19.0	+ 45.20 E		26.0	— 9 34	2676
. . . .	79 Aug. 20	+331.0 E	Schoenfeld thought period was shortening, in 1875; but my results show rather a cyclical irregularity	7 27.3	+ 8 32	2684

No.	Sch.	Star	1855.0 R.A.	1855.0 Decl.	Annual Variation		Discoverer	Date	Redness	Magnitude Max.	Magnitude Min.
			h m s	° ′	s	′					
2691	40	T Canis min.	7 25 56	+12 3.0	+3.34	—0.12	Schönfeld	1865	(2)	9.0– 9.7	<13.5
2735		U Canis min.	33 28	+ 8 42.2	3.26	0.13	Baxendell	1879	5.1	8.5– 9.0	12.3–13.5
2742	41	S Geminorum	34 20	+23 47.2	3.61	0.13	Hind	1848	(3)	8.2– 8.7*	<13.5
2780	42	T Geminorum	40 36	+24 5.5	3.61	0.14	Hind	1848	3.0	8.1– 8.7*	<13.5
2783		S Puppis	42 31	—47 45.4	1.74	0.14	Gould	1872?		7¼	9
2815	43	U Geminorum	46 30	+22 22.7	3.56	0.15	Hind	1855	0.0	8.9– 9.7*	13.1 *
2857		U Puppis	7 54 2	—12 26.6	2.81	0.16	Pickering	1881	3.2	8.5– 9.0	< 14
2946	44	R Cancri	8 8 34	+12 10.1	3.32	0.18	Schwerd	1829	5.3	6.0– 8.3	<11.7 *
2976	45	V Cancri	13 27	+17 44.5	3.43	0.18	Auwers	1870	4.3	6.8– 7.7	<12 *
3060	46	U Cancri	27 28	+19 23.5	3.45	0.20	Chacornac	1853	2.3	8.4–10.6	<13 *
3109	47	S Cancri	35 39	+19 33.2	3.44	0.21	Hind	1848	(1)	8.2 *	9.8 *
3170	48	S Hydrae	46 0	+ 3 36.8	3.13	0.22	Hind	1848	2.1	7.5– 8.7	<12.2 *
3186	49	T Cancri	48 23	+20 24.1	3.44	0.22	Hind	1850	7.4	8.0– 8.5	9.3–10.5*
3184	50	T Hydrae	8 48 37	— 8 35.4	2.92	0.22	Hind	1851	1.8	7.0– 8.1*	<13.0
3418		R Carinae	9 28 36	—62 8.9	1.52	0.26	Gould	1871	(5)	4.3– 5.7	9.3–10.0
3477	51	R Leonis min.	36 52	+35 10.6	3.62	0.27	Schönfeld	1863	6.0	6.1– 7.8	<12.5
3493	52	R Leonis	39 45	+12 5.9	3.23	0.27	Koch	1782	6.9	5.2– 6.7	9.4–10.0*
3495		*l* Carinae	41 16	—61 50.4	1.65	0.27	Gould	1871		3.7	5.2
3567		V Leonis	9 51 57	+21 57.3	3.36	0.28	Becker	1882	1.7	8.6	<13.5
3633		R Antliae	10 3 30	—37 1.2	2.58	0.29	Gould	1872		6.5	<8
3637		S Carinae	4 45	—60 50.4	1.92	0.29	Gould	1871	(5)	6¼	9
3712		U Leonis	16 17	+14 44.1	3.23	0.30	Peters	1876		9.5	<13.5
3796		U Hydrae	30 24	—12 38.1	2.96	0.31	Gould	1871	(7)	4.5	6.1– 6.3
3825	53	R Ursae Maj.	34 19	+69 32.1	4.38	0.31	Pogson	1853	1.6	6.0– 8.2	13.2
3847	54	η Argus	39 27	—58 55.4	2.31	0.31	Burchell	1827	(5)	>1 *	7.4
3881		V Hydrae	44 34	—20 28.8	2.91	0.32	Gould / Chandler	1874? / 1888	(9)	6.7	9.1<
3890		W Leonis	45 58	+14 29.2	3.18	0.32	Peters	1880		9?	< 14
3934	55	R Crateris	10 53 26	—17 32.8	2.95	0.32	Winnecke	1861	8.1	>8 *	<9 *
3994	56	S Leonis	11 3 21	+ 6 14.9	3.11	0.32	Chacornac	1856	0.0	9.0–10.0	<13 *
4160	57	T Leonis	31 0	+ 4 10.5	3.08	0.33	Peters	1862		10? *	<13.5
4300	58	X Virginis	54 25	+ 9 52.7	3.08	0.33	Peters	1871		7.8? *	12
4315	59	R Comae	11 56 49	+19 35.4	3.08	0.33	Schönfeld	1856	4.0	7.4– 8.0*	<13.5
4377	60	T Virginis	12 7 10	— 5 13.8	3.08	0.33	Boguslawski	1849	4.1	8.0– 8.8*	10–<13.5
4407	61	R Corvi	12 8	—18 26.9	3.09	0.33	Karlinski	1867	3.7	6.8– 7.7	<11.5 *
4492		Y Virginis	26 25	— 3 37.3	3.08	0.33	Henry	1874	3.6	8– 9.4	13–14
4511	62	T Ursae Maj.	29 47	+60 17.2	2.77	0.33	At Bonn	1860	2.0	6.7– 8.5	12.2–12.6
4521	63	R Virginis	31 9	+ 7 47.2	3.05	0.33	Harding	1809	1.3	6.5– 8.0	9.7–11.0
4536		R Muscae	33 17	—68 36.7	3.56	0.33	Gould	1871		6.6	7.4
4557	64	S Ursae Maj.	37 35	+61 53.3	2.66	0.33	Pogson	1853	3.2	7.0– 8.2	10.2–11.5
4596	65	U Virginis	12 43 45	+ 6 20.6	3.04	0.33	Harding	1831	1.1	7.7– 8.1*	12.2–12.8*
4805	66	W Virginis	13 18 33	— 2 37.4	3.09	0.31	Schönfeld	1856	0.4	8.7– 9.2*	9.8–10.4*
4816	67	V Virginis	20 19	— 2 25.2	3.09	0.31	Goldschmidt	1857	2.7	8.0– 9.0*	<13 *
4826	68	R Hydrae	21 48	—22 31.8	3.27	0.31	Montanari / Maraldi	1672 / 1704	5.9	3.5– 5.5	9.7
4847	69	S Virginis	25 26	— 6 26.8	3.13	0.31	Hind	1852	2.6	5.7– 7.8*	12.5 *
4948		R Canum Venat.	42 43	+40 15.9	2.58	0.30	Espin	1888		7½	<11
5037		RR Virginis	13 57 12	— 8 30.0	3.17	0.29	Peters	1880		>11	<14
5070		Z Virginis	14 2 33	—12 36.5	3.22	0.29	Palisa	1880		9.5– 11	<14
5095		R Centauri	6 10	—59 14.1	4.24	0.28	Gould	1871	(6)	6.0– 6.3	8.7– 9.8
5097	70	T Bootis	7 18	+19 44.7	2.81	0.28	Baxendell	1860		9.7? *	<13 *
5156		X Bootis	17 19	+16 58.8	2.84	0.28	Baxendell	1859	(4)	9.0– 9.4	10.2
5157	71	S Bootis	18 1	+54 28.3	2.01	0.28	At Bonn	1860	2.8	7.7– 8.5	12.5–13.2
5194		V Bootis	23 54	+39 30.4	+2.42	0.27	Dunér	1884	3.6	7.1– 7.3	9.4
5190	72	R Camelopardi	28 54	+84 29.2	—5.31	0.27	Hencke	1858	2.1	7.8– 8.6	12–13.5
5237	73	R Bootis	30 48	+27 22.1	+2.65	0.26	At Bonn	1858	2.7	5.9– 7.8	11.3–12.2*
5249		V Librae	14 32 18	—17 1.8	+3.32	—0.26	Schönfeld	1882		9.3	12.2

Greenwich Mean Time Min.	Max.	Period, etc.	Remarks	1900.0 R.A.	Decl.	No.
d h m	d h m	d h m s		h m	° ′	
. . . .	72 Feb. 3.6	+322.1 E *		7 28.4	+11 58	2691
79 Aug. 27	80 Mar. 15	+398.6 E		35.9	+ 8 36	2735
. . . .	65 Nov. 3.2	+294.2 E *		37.0	+23 41	2742
. . . .	63 Feb. 18.3	+288.1 E *		43.3	+23 59	2780
. . . .	. . . .	. . . .		43.8	—47 52	2783
. . . .	79 Oct. 24	+ 86.3 E	Law of period very complicated. The elements given represent obsns. since 1879, but with considerable deviations	49.2	+22 16	2815
. . . .	81 Mar. 8	+310 E		7 56.1	—12 34	2857
. . . .	52 Apr. 21.1	+352.81 E+0.207 E²	A lengthening of the period seems beyond doubt	8 11.0	+12 2	2946
. . . .	84 Jan. 8.5	+271.5 E		16.0	+17 36	2976
. . . .	84 Mar. 18.6	+305.2 E		30.0	+19 14	3060
67 Aug. 31 14 2.89	. . . .	+ 9 11 37 45 E *	Algol-type	38.2	+19 24	3109
. . . .	78 Mar. 18.3	+256.5 E		48.3	+ 3 27	3170
72 Aug. 2	. . . .	+482 E	Elements uncertain	51.0	+20 14	3186
. . . .	66 Jan. 26.5	+289.4 E *		8 50.8	— 8 45	3184
. . . .	71 July 26.1	+312.14 E		9 29.7	—62 21	3418
. . . .	65 Feb. 20.0	+373.5 E —0.033 E²	The shortening of the period seems clearly proved	39.6	+34 58	3477
80 Apr. 2.4	80 Aug. 28.4	+312.87 E	I find good evidence of cyclical variation of period, with a long term.	42.2	+11 54	3493
71 July 12	71 Aug. 1	+ 31.0 E		42.5	—62 3	3495
. . . .	82 April	+280 E	Elements mere guess-work	9 54.5	+21 45	3567
. . . .	. . . .	. . . .		10 5.5	—37 14	3633
. . . .	. . . .	. . . .	Period several months	6.2	—61 4	3637
. . . .	. . . .	. . . .		18.7	+14 31	3712
86 Mar. 29	85 Dec. 11.73	+194.65 E †	Elements are Espin's, very uncertain. Sawyer's obsns. confirm variability but give no period	32.6	—12 52	3796
52 Oct. 23	53 Mar. 12.5	+305.4 E —0.075 E²	Elements provisional; whether the marked deviations from uniform period are secular or not is uncertain	37.6	+69 18	3825
. . . .	. . . .	. . . .	Irregular	41.2	—59 10	3847
. . . .	73 March	+575 E	Elements very uncertain	46.8	—20 43	3881
. . . .	87 March?	+395 E ? †	Elements inferred by Parkhurst from his observations	48.3	+14 15	3890
. . . .	. . . .	. . . .	Schoenfeld finds, very uncertainly, period of 160d	10 55.6	—17 47	3934
. . . .	61 Jan. 3.0	+184.95 E+0.13 E²		11 5.7	+ 6 0	3994
. . . .	. . . .	. . . .		33.3	+ 3 56	4160
. . . .	. . . .	. . . .		56.7	+ 9 38	4300
. . . .	83 Sept. 15	+362 E	Elements very uncertain	11 59.1	+19 21	4315
. . . .	75 Mar. 14	+337 E	" " "	12 9.5	— 5 28	4377
. . . .	77 Dec. 31	+317.2 E	Periodical inequality evident	14.5	—18 42	4407
84 February	84 May	+210 E	Elements very uncertain	28.7	— 3 52	4492
82 Apr. 30	82 Aug. 21.0	+257.2 E	Evidence of periodical irregularity	31.9	+60 3	4511
09 Mar. 11.17	09 May 29.17	+145.63 E+	+12d.5 sin(2°.5 E+135°) + 4 .5 sin(5 0 E+ 65) Elements provisional	33 4	+ 7 33	4521
. . . .	. . . .	0 21 20 †	Period is Gould's; min. precedes max. 9 hours	36.0	—68 51	4536
60 Feb. 4.0	60 May 21.4	+223.92 E+0.102 E²	Signs of periodical irregularity	39.6	+61 39	4557
82 Feb. 13.0	82 May 12.0	+207.2 E		12 46.0	+ 6 6	4596
69 Apr. 17.466	69 Apr. 25.666	+ 17.27263 E *		13 20.9	— 2 52	4805
. . . .	67 Sept. 4	+251 E *		22.6	— 2 39	4816
. . . .	1764 Dec. 22.5	+496.91 E —0.2307 E²	—0d.001276 E³ +80d.5 sin(4°.3 E+353°.7) Gould has an entirely different law	24.2	—22 46	4826
63 Feb. 9	63 May 17.0	+376.0 E	Schoenfeld favors assumption of secular shortening of period; my results show rather periodical irregularity	27.8	— 6 41	4847
. . . .	. . . .	. . . .		44.6	+40 2	4948
. . . .	86 June	+383 E †	Elements inferred by Parkhurst from his observations	13 59.6	— 8 43	5037
. . . .	80 May 25.4	+302.6 E	Elements represent Markree observation in 1855	14 5.0	—12 50	5070
. . . .	. . . .	. . . .	Period probably long and irregular	9.4	—59 27	5095
. . . .	. . . .	. . . .	Only one appearance known	9.4	+19 32	5097
82 Aug. 15	82 Nov. 7	+123 E		19.4	+16 46	5156
80 Jan. 14	80 June 9.0	+272.3 E		19.5	+54 16	5157
85 Jan. 29	84 Sept. 3	+266.5 E †	Duner's elements	25.7	+39 18	5194
. . . .	82 Dec. 10	+269.5 E		25.1	+84 17	5190
80 Mar. 13	80 June 23.0	+223.9 E		32.8	+27 10	5237
. . . .	. . . .	. . . .		14 34.8	—17 14	5249

No.	Sch.	Star	1855.0 R.A.	1855.0 Decl.	Annual Variation		Discoverer	Date	Redness	Magnitude Max.	Magnitude Min.
			h m s	° '	s	'					
5274		W Bootis	14 37 3	+27 8.9	+2.64	−0.26	Schmidt	1867		5.2	6.1
5338		U Bootis	47 37	+18 17.1	2.78	0.25	Baxendell	1880	2.7	9.1– 9.3	12–13.6
5374	74	δ Librae	14 53 14	− 7 56.4	3.20	0.24	Schmidt	1859	(1)	5.0	6.2
5430		T Librae	15 2 28	−19 27.8	3.41	0.23	Palisa	1878		10.2	<14
5438		Y Librae	4 2	− 5 27.6	3.16	0.23	Bauschinger	1887		8½	?
5465		R Triang. austr.	6 52	−65 57.5	5.25	0.23	Gould	1871		6.6	8.0
5484	75	U Coronae	12 17	+32 10.8	2.45	0.22	Winnecke	1869	0.0	7.5	8.9
5494	76	S Librae	13 4	−19 51.7	3.43	0.22	Borrelly	1872	3.0	8.0– 8.3	<13
5501	77	S Serpentis	14 52	+14 50.3	2.81	0.22	Harding	1828	4.1	7.6– 8.7	12.5? *
5504	78	S Coronae	15 29	+31 53.5	2.44	0.22	Hencke	1860	4.9	6.1– 7.8*	11.9–12.5*
5583		X Librae	27 50	−20 40.8	3.47	0.21	Peters	1878		11?	<14
5593		W Librae	29 40	−15 41.5	3.37	0.20	Peters	1878		11?	<14
5617		U Librae	33 37	−20 42.6	3.48	0.20	Peters	1878	3.4	9	<14
5667	79	R Coronae	42 36	+28 36.3	2.47	0.19	Pigott	1795	0.5	5.8 *	13.0 *
5677	80	R Serpentis	44 1	+15 34.6	2.76	0.19	Harding	1826	3.7	5.6– 7.6*	13
5682		R Lupi	44 5	−35 51.6	3.87	0.19	Gould	1884		9	<11
5675		V Coronae	44 21	+40 0.7	2.14	0.19	Dunér	1878	5.9	7.2– 7.7	10.3–12.0
5688	81	R Librae	45 24	−15 48.1	3.39	0.18	Pogson	1858	(2)	9.2–10.0*	<13 *
5732	82	T Coronae	53 26	+26 20.1	2.51	0.18	Birmingham	1866	(1)	2.0 *	9.5 *
5770	83	R Herculis	15 59 43	+18 45.9	2.68	0.17	At Bonn	1855	2.0	8.0– 9.2	<13 *
5776		X Scorpii	16 0 2	−21 8.3	3.52	0.17	Peters	1876		>11	<13
5795		W Scorpii	3 18	−19 45.3	3.49	0.16	J. Palisa	1877		10–11.2	14.5
5826	84	T Scorpii	8 25	−22 36.7	3.56	0.16	Auwers	1860		7.0 *	<12
5830	85	R Scorpii	9 1	−22 35.0	3.56	0.16	Chacornac	1853	0.9	9.4–10.5	<13
5831	86	S Scorpii	9 2	−22 32.0	3.56	0.16	Chacornac	1854	(0)	9.1–10.5*	<13
5856		W Ophiuchi	13 36	− 7 21.3	3.23	0.15	Schönfeld	1881	3.0	8.9– 9.5	<13.5
5860	87	U Scorpii	14 7	−17 32.3	3.44	0.15	Pogson	1863		9? *	<12 *
5887		V Ophiuchi	18 40	−12 5.5	3.33	0.14	Dunér	1881	6.6	7.0	9.6–10.5
5889	88	U Herculis	19 23	+19 13.6	2.65	0.14	Hencke	1860	6.5	6.6– 7.8	11.4–12.7
5912	89	g Herculis	23 53	+42 12.2	1.97	0.13	Baxendell	1857	(3)	4.7– 5.5	5.4– 6.0
5928	90	T Ophiuchi	25 27	−15 49.2	3.42	0.13	Pogson	1860		10 *	<12.5 *
5931	91	S Ophiuchi	25 55	−16 51.1	3.44	0.13	Pogson	1854	(1)	8.3– 9.0*	<13
5950		W Herculis	30 5	+37 38.1	+2.12	0.13	Dunér	1880	3.2	8.0– 8.4	11.5–14
5948		R Ursae min.	31 57	+72 34.4	−0.88	0.13	Pickering	1881	3.2	8.6– 9.0	10.5
5955		R Draconis	32 17	+67 3.5	+0.14	0.12	Geelmuyden	1876	2.0	6.5– 8.7	13
6044	92	S Herculis	45 18	+15 11.4	2.73	0.11	At Bonn	1856	5.6	5.9– 7.5	11.5–13
6083	93	Ophiuchi	51 23	−12 40.0	3.36	0.10	Hind	1848	(5)	5.5 *	12.5 *
6088		V Herculis	52 58	+35 17.4	2.17	0.10	Baxendell	1880	1.0	9.5	11.7
6132	94	R Ophiuchi	16 59 27	−15 53.7	3.44	0.09	Pogson	1853	4.5	7.0– 8.1	<12 *
6181	95	α Herculis	17 8 2	+14 33.5	2.73	0.07	W. Herschel	1795	(5)	3.1 *	3.9 *
6189		U Ophiuchi	9 11	+ 1 22.6	3.04	0.07	Gould / Sawyer	1871 / 1881	(0)	6.0	6.7
6202	96	u Herculis	11 58	+33 15.5	2.21	0.07	Schmidt	1869?	(4)	4.6 *	5.4 *
6268	97	Serpentarii	21 57	−21 21.2	3.59	0.06	Fabricius	1604		>1 *	? *
6368	98	X Sagittarii	38 26	−27 46.2	3.77	0.03	Schmidt	1866	(1)	4 *	6 *
6472	99	W Sagittarii	17 55 45	−29 34.9	3.83	−0.01	Schmidt	1866	(1)	5 *	6.5 *
6512	100	T Herculis	18 3 37	+30 59.9	2.27	+0.01	At Bonn	1857	1.4	6.9– 8.5	9.8–12.7
6573		Y Sagittarii	12 51	−18 55.2	3.53	0.02	Sawyer	1886	(0)	5.8	6.6
6624	101	T Serpentis	21 44	+ 6 12.5	2.93	0.03	Baxendell	1860	2.0	9.1–10.5	<13.5
6633	102	V Sagittarii	22 54	−18 21.5	3.51	0.03	Quirling	1865	0.6	7.6	8.8
6636	103	U Sagittarii	23 21	−19 13.3	3.53	0.03	Schmidt	1866	3.7	7.0 *	8.3 *
6682		X Ophiuchi	31 26	+ 8 42.3	2.87	0.05	Espin	1886	(5)	6.8	9?
6726	104	T Aquilae	38 47	+ 8 35.7	2.88	0.06	Winnecke	1860	3.3	8.8 *	10.0
6733	105	R Scuti	39 45	− 5 51.4	3.21	0.06	Pigott	1795	(4)	4.7– 5.7*	6.0– 9.0
6760		κ Pavonis	41 58	−67 24.4	6.23	0.06	Thome	1872		4.0	5.5
6758	106	β Lyrae	44 44	+33 11.8	2.21	0.06	Goodricke	1784	(1)	3.4 *	4.5 *
6794	107	R Lyrae	18 50 55	+43 45.5	+1.83	+0.08	Baxendell	1856	(4)	4.0	4.7

Greenwich Mean Time Min.	Greenwich Mean Time Max.	Period, etc.	Remarks	1900.0 R.A.	1900.0 Decl.	No.
d h m	d h m	d h m s		h m	° ′	
. . . .	. . . .	. . . .	Period long and irregular. Variability confirmed by Schwab	14 39.0	+26 57	5274
. . . .	80 Mar. 25.5	+173.8 E		49.7	+18 6	5338
67 Oct. 25 9 17.5	. . . .	+ 2 7 51 22.8 E	Algol-type	14 55.6	− 8 7	5374
. . . .	78 May 30	+723 E		15 5.0	−19 38	5430
. . . .	. . . .	. . . .		6.4	− 5 38	5438
71 July 12 16	71 July 14 15	+ 3 9 35 E †	Period is Gould's. Epochs of max. and min. inferred from Cordoba observations	10.8	−66 8	5465
88 Jan. 0 13 8	. . . .	+ 3 10 51 8.6 E	Algol-type	14.1	+32 1	5484
79 Dec. 23	80 Apr. 1	+192.3 E		15.6	−20 2	5494
. . . .	28 Apr. 2.5	+365.25 E	+55d sin (5° E+30°)	17.0	+14 40	5501
82 Jan. 16	82 May 16.8	+360.57 E		17.3	+31 44	5504
. . . .	. . . .	. . . .	Parkhurst confirms variability	30.4	−20 50	5583
. . . .	. . . .	. . . .	" " "	32.2	−15 51	5593
. . . .	. . . .	. . . .	My observations confirm variability, but give no times of maxima	36.2	−20 52	5617
. . . .	. . . .	. . . .	Irregular	44.4	+28 28	5667
. . . .	27 May 2.0	+357.6 E	+45d sin (5° E+15°)	46.1	+15 26	5677
. . . .	. . . .	. . . .		47.0	−36 0	5682
. . . .	78 Oct. 13.3	+359.5 E		46.0	+39 52	5675
. . . .	58 Apr. 6	+730 E	Elements very uncertain	47.9	−15 56	5688
. . . .	. . . .	. . . .	Nova	15 55.3	+26 12	5732
. . . .	65 July 18.0	+318.4 E	+20d sin (12° E+324°)	16 1.7	+18 38	5770
. . . .	. . . .	. . . .	Parkhurst thinks the changes are irregular.	2.7	−21 16	5776
. . . .	76 May 18	+224.3 E		5.9	−19 52	5795
. . . .	. . . .	. . . .	Nova in cluster Messier 80	11.1	−22 44	5826
. . . .	82 Apr. 14.0	+224.5 E	There is strong evidence of marked inequality of short term, in the period	11.7	−22 42	5830
. . . .	79 Dec. 28.0	+176.7 E		11.7	−22 39	5831
. . . .	81 July 18	+323.6 E	Period 328d.8 will also represent Bessel's observation	16.0	− 7 28	5856
. . . .	. . . .	. . . .	Only one appearance known	16.7	−17 39	5860
. . . .	74 Apr. 30	+307 E	Older data conflict with elements derived from observations 1860 to 1885. Hence period is perhaps not uniform	21.2	−12 12	5887
81 Sept. 9	82 Mar. 3.0	+410.5 E		21.4	+19 7	5889
. . . .	. . . .	. . . .	Irregular; limits of variation from Sawyer's observations	25.4	+42 6	5912
. . . .	70 Feb. 23	+361 E	Very rude approximation to the elements	28.0	−15 55	5928
. . . .	65 Mar. 4.4	+233.8 E *		28.5	−16 57	5931
. . . .	79 June 12	+288.7 E	Safarik has period of 337d. Possibly star has secondary fluctuations, and irregular period.	31.7	+37 32	5950
81 May 23	81 July 15	+180 E?	Elements represent Lalande's and the DM. observations	31.3	+72 29	5948
. . . .	58 June 5.0	+245.9 E		32.4	+66 58	5955
56 Mar. 27	56 Sept. 1	+309.0 E	+55d sin (7°.5 E+100°) Elements provisional	47.3	+15 6	6044
. . . .	. . . .	. . . .	Nova	53.9	−12 45	6083
. . . .	83 Nov. 5	+ {257.5 / 324.0} E	Additional observations only can distinguish which is the correct period	16 54.6	+35 13	6088
. . . .	65 Oct. 21.7	+302.4 E *		17 2.0	−15 58	6132
. . . .	. . . .	. . . .	Irregular. Period two or three months with wide fluctuations from the mean	10.1	+14 30	6181
81 July 17 15 33.52	. . . .	+ 0 20 7 41.6 E— 40 ?	−0s.0002 E². Algol-type	11.5	+ 1 19	6189
. . . .	. . . .		Period subject to many anomalies. Very rapid secondary oscillations near minimum remarked by Schmidt, confirmed by Schwab	13.6	+33 12	6202
. . . .	. . . .	. . . .	Nova	24.6	−21 24	6268
83 July 8.867	83 July 11.743	+ 7.01185 E *	My investigation gives merely nominal corrections to Schoenfeld's elements, which are therefore retained	41.3	−27 48	6368
83 Aug. 12.268	83 Aug. 15.425	+ 7.59445 E		17 58.6	−29 35	6472
67 Dec. 22.3	68 Mar. 9.3	+164.75 E	+5d sin (7°.2 E+57°.6)	18 5.3	+31 0	6512
86 Sept. 23.51	86 Sept. 25.31	+ 5.7690 E		15.5	−18 54	6573
. . . .	67 Dec. 2.1	+342.3 E *		23.9	+ 6 14	6624
. . . .	. . . .	. . . .	Irregular	25.5	−18 20	6633
83 Aug. 14.658	83 Aug. 17.624	+ 6.74493 E		26.0	−19 12	6636
. . . .	. . . .	. . . .		33.6	+ 8 45	6682
. . . .	. . . .	. . . .	Period three to five months, and irregular	41.0	+ 8 38	6726
86 July 18	86 Aug. 22	+ 71.1 E	Argelander's period with provisional epochs determined from observations 1885–87	42.1	− 5 49	6733
71 Nov. 29.8	71 Dec. 3.8	+ 9.097 E		46.6	−67 21	6760
55 Jan. 6 14 28.7	. . . .	+12 21 46 58.3+ †	+0s.4217 E² −0s.00007 E³ W. M. Reed's elements Secondary minimum about midway	46.4	+33 15	6758
87 Oct. 1	87 Oct. 16	+ 46.0 E	Schoenfeld's period with epochs found from Sawyer's 1887 observations	18 52.3	+43 49	6794

No.	Sch.	Star	1855.0 R.A.	1855.0 Decl.	Annual Variation		Discoverer	Date	Redness	Magnitude Max.	Magnitude Min.
			h m s	° '	s	'					
6806	108	S Coronae austr.	18 51 22	—37 8.6	+4.06	+0.08	Schmidt	1866		<9.5	13.0
6811	109	R Coronae austr.	52 8	—37 8.8	4.06	0.08	Schmidt	1866		9.8–11.5	13.2
6812		T Coronae austr.	52 12	—37 9.	4.06	0.08	Schmidt	1876		<9.8	13
6849	110	R Aquilae	18 59 23	+ 8 0.8	2.89	0.09	At Bonn	1856	5.5	6.4– 7.4*	10.9–11.5
6903	111	T Sagittarii	19 7 52	—17 13.2	3.46	0.10	Pogson	1863	6.5	7.6– 8.1*	<11 *
6905	112	R Sagittarii	8 11	—19 33.5	3.52	0.10	Pogson	1858	3.6	7.0– 7.2*	<12 *
6921	113	S Sagittarii	10 57	—19 17.1	3.51	0.10	Pogson	1860	(0)	9.7–10.4*	<13
6984		U Aquilae	21 33	— 7 20.3	3.23	0.12	Sawyer	1886	(0)	6.3	7.3
7045	114	R Cygni	32 56	+49 52.5	1.61	0.13	Pogson	1852	6.0	5.9– 8.0*	<13
7101	115	11 Vulpeculae	41 37	+26 57.7	2.46	0.14	Anthelm	1670		3 *	? *
7106	116	S Vulpeculae	42 27	+26 55.7	2.46	0.15	Hind / Baxendell	1861 / 1862	3.0	8.4– 8.9*	9.0– 10.0
7120	117	χ Cygni	45 0	+32 33.0	2.31	0.15	Kirch	1686	6.3	4.0– 6.5	13.5
7124	118	η Aquilae	45 5	+ 0 38.2	3.06	0.15	Pigott	1784	(2)	3.5 *	4.7 *
7149		S Sagittae	49 25	+16 15.4	2.73	0.15	Gore	1885	(0)	5.6	6.4
7192		Z Cygni	19 57 21	+49 38.4	1.70	0.16	Espin	1887	(7)	7?	14?
7220	119	S Cygni	20 2 28	+57 34.2	1.26	0.17	At Bonn	1860	5.1	8.8–11.3	<13 *
7234	120	R Capricorni	3 10	—14 41.6	3.37	0.17	Hind	1848	(4)	8.8– 9.7*	<13 *
7242	121	S Aquilae	4 57	+15 11.5	2.76	0.17	Baxendell	1863	0.8	8.4–10.1	10.7–11.8*
7252		W Capricorni	5 57	—22 24.9	3.54	0.17	Peters	1872?		11?	14?
7257	122	R Sagittae	7 27	+16 17.4	2.74	0.18	Baxendell	1859	0.8	8.5– 8.7*	9.8–10.4*
7261	123	R Delphini	7 55	+ 8 39.1	2.90	0.18	Hencke / Schoenfeld	1851 / 1859	4.0	7.6– 9.0	11.1–12.8
7285	124	P Cygni	12 27	+37 35.1	2.21	0.18	Jansen	1600	(2)	3– 5 *	<6 *
7299	125	U Cygni	15 7	+47 26.3	+1.86	0.19	Knott	1871	9.3	7.0– 8.1	9.4–11.6
7194	126	R Cephei	34 37	+88 41.0	—42	0.21	Pogson	1856	0.5	5? *	10? *
7431	127	S Delphini	36 24	+16 34.2	+2.76	0.21	Baxendell	1860	6.0	8.4– 9.0	10.4–12.0
7428		V Cygni	36 38	+47 37.5	1.94	0.21	Birmingham	1881	8.3	6.8– 9.5	13.5
7437		X Cygni	37 44	+35 4.0	2.35	0.21	Chandler	1886	(0)	6.4	7.2– 7.7
7444	128	T Delphini	38 38	+15 52.5	2.78	0.21	Baxendell	1863	2.0	8.2–10.3	<13 *
7455	129	U Capricorni	40 4	—15 18.8	3.35	0.22	Pogson	1858		10.2–10.8*	<13 *
7456		RR Cygni	41 3	+44 20.4	2.08	0.22	Espin	1888	(6)	8?	9.5?
7459	130	T Cygni	41 24	+33 50.6	2.39	0.22	Schmidt	1864	(1)	5.5? *	6? *
7468	131	T Aquarii	42 17	— 5 40.9	3.17	0.22	Goldschmidt	1861	1.2	6.7– 7.8	12.4–13.0
7483		T Vulpeculae	45 19	+27 42.3	2.54	0.22	Sawyer	1885	(0)	5.5	6.5
7488		Y Cygni	46 16	+34 7.0	2.39	0.22	Chandler	1886	(0)	7.1	7.9
7560	132	R Vulpeculae	57 56	+23 14.9	2.66	0.23	At Bonn	1858	2.0	7.5–8.5 *	12.5–13.6
7571		V Capricorni	20 59 9	—24 30.2	3.50	0.24	Peters	1867		9.5?	14?
7577		X Capricorni	21 0 15	—21 55.8	3.45	0.24	Peters	1872?		11.5?	<14
7609		T Cephei	7 33	+67 54.4	0.82	0.24	Ceraski	1878	6.3	5.6– 6.8	9.5– 9.9
7659	133	T Capricorni	14 0	—15 46.4	3 32	0.25	Hind	1854	(2)	8.9– 9.7*	<13 *
7754		W Cygni	30 34	+44 43.7	2.27	0.27	Gore	1885	(5)	6.1– 6.3	6.7
7787		Cygni	36 1	+42 11.0	+2.36	0.27	Schmidt	1876	(3)	3	13.5
7779	134	S Cephei	36 57	+77 58.2	—0.60	0.27	Hencke	1858	9.1	7.4– 8.5*	11.5 *
7803	135	μ Cephei	39 4	+58 7.0	+1.83	0.27	Hind / Argelander	1848	6.2	4? *	5? *
7907		U Aquarii	21 55 24	—17 19.5	3.29	0.29	Peters	1881		10?	14?
7944	136	T Pegasi	22 1 49	+11 49.9	2.93	0.29	Hind	1863	(3)	8.5– 9.3	<13
7994		R Piscis austr.	9 45	—30 19.6	3.43	0.30	Gould	1884		5.7?	<11?
8073	137	δ Cephei	23 48	+57 40.4	2.21	0.31	Goodricke	1784	(2)	3.7 *	4.9 *
8093		R Indi	25 36	—68 2.1	4.40	0.31	Gould	1884		9?	11?
8153		R Lacertae	36 50	+41 36.8	2.65	0.31	Deichmüller	1883	1.8	8.6– 9.3	<13.5
8230	138	S Aquarii	49 20	—21 7.0	3.23	0.32	Argelander	1853	4.0	7.7– 9.1*	<12.5
8273	139	β Pegasi	56 45	+27 17.8	2.90	0.32	Schmidt	1847	(2)	2.2 *	2.7 *
8290	140	R Pegasi	22 59 22	+ 9 45.7	3.01	0.32	Hind	1848	(4)	6.9– 7.9	<13
8373	141	S Pegasi	23 13 13	+ 8 7.6	3.03	0.33	Marth	1864?	1.7	7.3– 8.0	<13
8512	142	R Aquarii	36 19	—16 5.3	3.11	0.33	Harding	1811	4.3	5.8– 8.5*	11? *
8588		R Phoenicis	48 55	—50 35.6	3.14	0.33	Gould	1884		8½?	11?
8597		V Ceti	50 29	— 9 46.1	3.08	0.33	Peters	1879		9.7?	14?
8600	143	R Cassiopeae	23 51 4	+50 34.9	+3.01	+0.33	Pogson	1853	6.5	4.8– 7.0	9.8– 12

Greenwich Mean Time Min.	Max.	Period, etc.	Remarks.	1900.0 R.A.	Decl.	No.
d h m	d h m	d h m s		h m	° ′	
....	....	6 ?	Schmidt formerly thought period is six days; but his observations since 1881 throw doubt on periodicity	18 54.4	—37 5	6806
....	....	30.5 ?	In west end of a small nebula	55.2	—37 5	6811
....	....	....	4s foll. R Coronae austr.	55.3	—37 5	6812
56 Mar. 23	56 Aug. 7	$+352.3$ E -0.4 E^2	Elements provisional, but rapid shortening of period pretty certain	19 1.5	+ 8 5	6849
....	83 July 7	+384 E		10.5	—17 9	6903
....	69 June 28	+270 E *		10.8	—19 29	6905
....	69 Nov. 20	+230 E *		13.6	—19 13	6921
86 Sept. 17.5	86 Sept. 20.0	+ 7.033 E		24.0	— 7 15	6984
....	81 Aug. 7	+425.7 E		34.1	+49 58	7045
....	....	....	Nova	43.5	+27 4	7101
85 Apr. 7.5	85 Apr. 27.8	+ 67.80 E †	Elements of J. Baxendell, Jr.	44.3	+27 2	7106
....	1763 May 26.76	+406.045 E	{ $+0^d.00574$ E^2 $+0^d.000173$ E^3 Elements provisional.	46.7	+32 40	7120
88 Jan. 4 3 32	88 Jan. 6 12 32	+ 7 4 14 0.0 E	Elements adopted are a correction of +1h 43m of Argelander's epoch 400, and of —4s of his period	47.4	+ 0 45	7124
85 Dec. 1 9 36	85 Dec. 4 9 36	+ 8 9 11.0 E		51.4	+16 22	7149
....	....	....		19 58.6	+49 46	7192
....	65 July 9.2	$+323.3$ E -0.067 E^2		20 3.4	+57 42	7220
....	64 Sept. 3	+347 E *		5.7	—14 34	7234
70 Jan. 29.2	....	+146.71 E *		7.0	+15 19	7242
....	85 Sept.	+425 E? †	Elements from Parkhurst's observations; very uncertain	8.6	—22 17	7252
73 May 1.03	....	+ 70.43 E *	{ Type of Beta Lyrae. Secondary minimum follows principal one 34d.9. Evidence of systematic but small deviations from uniform period	9.5	+16 25	7257
....	69 July 13.6	+284.0 E *		10.5	+ 8 47	7261
....	....	....	Nova	14.1	+37 43	7285
77 Feb. 21.5	77 Oct. 9.6	+461.3 E †	Elements are Baxendell's	20 16.5	+47 35	7299
....	....	....	{ Schoenfeld thinks period somewhat less than a year; Schmidt s obsns. confirm; variations generally between 8.0 and 8.5.	19 58.9	+88 50	7194
73 May 10	73 Aug. 22	+277.0 E	Evidence of periodic inequality	20 38.5	+16 44	7431
....	81 June 1	+423 E?	A secondary maximum follows principal one, two or three months	38.1	+47 47	7428
86 Oct. 7 23 56	86 Oct. 13 14 20	+ 15 14 24 E	Bright and faint minima, but not regularly alternating	39.5	+35 13	7437
....	84 Sept. 10.0	+331.9 E	Large deviations from a mean period	40.7	+16 2	7444
....	72 Sept. 19	+203.5 E *		42.6	—15 9	7455
....	....	....		42.6	+44 30	7456
....	....	....	Period about one year, but variations in some years scarcely noticeable	43.2	+34 0	7459
81 Feb. 15.5	81 May 10.5	+203.3 E		44.7	— 5 31	7468
85 Nov. 1 19 8.6	85 Nov. 2 20 35.0	+ 4 10 29.0 E		47.2	+27 52	7483
88 July 15 19 8	....	+ 1 11 56 48	Algol-type. Large anomalies in period	48.0	+34 17	7488
65 July 19.0	65 Sept. 20.0	+136.9 E+	{ 20d sin (4° E+90°) Schoenfeld had a term —0.06 E2, but later observations do not confirm it	20 59.9	+23 25	7560
....	86 Sept.	+310 E? †	Elements from Parkhurst's observations, but uncertain	21 1.8	—24 19	7571
....	85 Sept.	+210 E? †	" " " " " "	2.8	—21 45	7577
73 Feb. 6	73 Aug. 23	+383.2 E		8.2	+68 5	7609
....	66 Nov. 13.2	+269.4 E *		16.5	—15 35	7659
84 Oct. 12	84 Dec. 13	+126 E		32.3	+44 56	7754
....	....	....	Nova	37.8	+42 23	7787
80 Sept. 16	81 May 16	+484 E		36.5	+78 10	7779
....	....	+432?	Argelander's period from his observations 1848–64; but those of Schmidt since 1866 do not confirm it	40.4	+58 19	7803
....	....	....	Parkhurst's observations confirm variability, but give no maximum	21 57.9	—17 16	7907
....	69 Nov. 14	+373 E	There is apparently a large periodical inequality of short term	22 4.0	+12 3	7944
....	....	....		12.3	—30 6	7994
88 Jan. 0 15 57.0	88 Jan. 2 6 32.5	+ 5 8 47 39.974 †	Argelander's elements	25.4	+57 54	8073
....	....	....		28.9	—67 48	8093
....	83 Dec. 14	+315 E	Elements very uncertain	38.8	+41 51	8153
....	67 Aug. 11	+279.3 E		51.7	—20 53	8230
....	....	....	Period of one or two months, but the star's light is often nearly constant for many months	22 58.9	+27 32	8273
....	50 Dec. 6	$+378.1$ E $+0^d.17$ E^2		23 1.6	+10 0	8290
....	77 Dec. 19	+317.5 E		15.5	+ 8 22	8373
....	11 Nov. 30.6	+387.16 E+	35d sin (10° E+235°)	38.6	—15 50	8512
....	....	....		51.3	—50 21	8588
....	86 Sept.	+273 E? †	Elements from Parkhurst's observations, and uncertain	52.8	— 9 31	8597
54 Feb. 10 ?	54 July 9.5	+429.0 E+	23d sin(16° E+346°)	2353.3	+50 50	8600

(*Continued from page 83.*)

one-tenth of the right-ascension, expressed in time-seconds, for the equinox 1900.0. The precept need not be rigorously applied where two or more variables occur within a few seconds of right-ascension, as it would be better to deviate from the strict order by one or two units than to disturb numbers already affixed.

The numbers of this catalogue have been taken in accordance with these principles; and it is respectfully submitted to the judgement of astronomers whether the system deserves general adoption.

The selection of the stars to be included in the catalogue has been a delicate task, whose difficulty can only be appreciated by those who are familiar with the confusion which so easily creeps into this branch of astronomy, and who have had occasion to undertake the discouraging and thankless labor of bringing order out of the chaos, by the careful and continuous observation necessary to discriminate the actual cases of variability from the numerous pseudo-variables with which the periodicals of the day are filled.

Considering it extremely desirable that no star should be placed in the list, no matter how high the authority on which its variability is asserted, without independent verification, I have had under observation a large number of stars during the last few years with this especial object in view. Mr. SAWYER, also, has similarly followed an extensive list, generally of the brighter class; and I have had the inestimable advantage of access to his results, and of consultation with him as to the propriety of the insertion of many of these stars. Another class of variables, mainly those discovered by Dr. PETERS, which I found considerable difficulty in keeping track of with insufficient optical means, has been assiduously and effectively observed by Mr. H. M. PARKHURST, and his series of observations has been the main reliance for the attestation of the variability of these faint stars. Without the cordial collaboration of these gentlemen the present work would have been much less complete.

Two remarks remain as to the selection of the stars. First, all stars of SCHÖNFELD's catalogue have been retained, although there appears to be perhaps a slight ground for doubt as to one or two of them. Thus, for instance, I have never been able to detect any trace of fluctuation in δ *Orionis*, and I believe SAWYER has a similar experience. But its rejection cannot be justified on this ground alone, in the face of high authority in favor of the variability. Secondly, as to the additions, I have had in mind as a paramount object that our knowledge must be kept clear of confusion, even at the risk of an incomplete statement of it; and that the omission of a star actually variable is not as injurious an imperfection in the catalogue as the insertion of one which is not so. Therefore, where a reasonable doubt has appeared to exist as to any star, it has been excluded until it could be further examined. A list of some of these cases is given below, with a succinct statement of the reasons for their omission.

NOTES RELATING TO STARS NOT INSERTED IN THE CATALOGUE.

Positions for Equinox 1855.0.

$1^h\ 18^m\ 31^s$ —4° 40′.9

GOULD thinks certainly variable. SAWYER's observations show no trace of fluctuation; his numerous estimates, ranging over a long period, all lie between 6.5 and 6.8.

$1^h\ 27^m\ 11^s$ +11° 48′.6

In BORRELLY's list, *Bull. Astron.* II. GORE thought near maximum 1885 Nov. 30, but observed only slight variability in 1886. SAWYER thinks it is not variable.

$1^h\ 33^m\ 0^s$ —7° 21′.6

SAFARIK thinks variable from 8.4 to 9.2, from his observations 1887 Oct. to 1888 Feb. 19; period probably longer than four months.

$3^h\ 41^m\ 9^s$ +35° 16′.7

KAM suspects variability; see *A.N.* CX, 181. By my observations 1888 April 2, and Aug. 11, it must have been below 11.5 or 12.0.

$3^h\ 45^m\ 26^s$ +7° 20′.6

GOULD thought certainly variable, from 6.8 to 8.0. My observations seem to favor fluctuation, but I desire to continue them before pronouncing definitely.

$4^h\ 48^m\ 48^s$ —16° 39′.3

GOULD's *R Eridani*. SAWYER's observations do not show any change of light.

$4^h\ 53^m\ 11^s$ —12° 45′.1

GOULD's *S Eridani*. SAWYER's observations do not show any change of light.

$5^h\ 21^m\ 48^s$ —4° 49′.1

SAFARIK thinks variable by several magnitudes. Near *S Orionis*. See *V.J.S.* 1884, p. 145.

$5^h\ 22^m\ 22^s$ —1° 11′.7

GOULD says it appears to be variable from $4\frac{3}{4}$ to 6. The star is very red. GORE thinks his observations confirm variability.

$5^h\ 27^m\ 10^s$ +10° 8′.1

GOULD thinks variable, from discordance of Cordoba estimates, 5.7 to 6.7. Other observations do not appear to confirm.

$6^h\ 12^m\ 54^s$ +47° 43′.5

ESPIN suggests variability. Not yet confirmed.

$7^h\ 21^m\ 3^s$ —11° 15′.9

Espin asserts variability and assigns a period of fourteen days; in which he is confirmed by Jackson. But Sawyer, Yendell and myself have carefully followed it without detecting the slightest change. I consider the constancy of its light practically demonstrated.

$7^h\ 35^m\ 15^s$ —31° 19′.6

Gould's *R Puppis*. Neither Sawyer's observations nor mine show any unsteadiness of lustre.

$7^h\ 43^m\ 11^s$ —40° 17′.5

Gould's *T Puppis*. Sawyer has followed the star as closely as the low altitude of the star in this latitude will permit, and has yet found no confirmation.

$8^h\ 1^m\ 34^s$ +19° 50′.0

Peters announced as variable, *A.N.* CII, 147. My observations do not confirm, but are indecisive. Parkhurst thinks that, if variable, it may possibly be of *Algol*-type, but the evidence of change by his observations is also slight.

$10^h\ 0^m\ 42^s$ —51° 29′.0

Gould's *R Velorum*. As he gives no period, and there are no other confirmatory observations, I have considered it safer not to insert it in the catalogue.

$10^d\ 49^m\ 30^s$ —59° 44′.8

Gould's *T Carinae*. Upton's comparisons in 1883 seem to confirm, but the observed limits of variation are so small that I think more evidence is essential before classing it with the known variables.

$12^h\ 26^m\ 47^s$ —22° 35′.7

β Corvi. Sawyer's observations seem to show clearly the variation of this star, but he agrees with me that it is better to await confirmation before inserting in the catalogue. See *A.N.* CXI, 271.

$13^h\ 26^m\ 58^s$ —12° 28′.0

Schmidt thought variable, and Gould that the Cordoba estimates confirmed it, and the latter suggested the name *Y Virginis*. Sawyer, however, has eight observations, in different years, all within the narrow range 6.0 to 6.25; and he is very skeptical as to its variability. The star is very difficult to observe, which may account for the discordances. See my note *H.C.O. Annals*, XIV, Part II, p. 456, star No. 2293.

$14^h\ 56^m\ 20^s$ —68° 9.4

Gould's *T Triang. austr.* He says it is variable between 7.0 and 7.4, in a period which differs but little from a mean solar day. The assigned limits are so narrow that confirmation by other observations is desirable, to justify its insertion in the catalogue.

$15^h\ 35^m\ 17^s$ —10° 27′.7

Weiss says it is variable from 7.0 to 8.8, in a period of about four months. My observations yet do not enable me to confirm the variation certainly.

$15^h\ 37^m\ 55^s$ —20° 40′.8

Peters announced the variability, *A.N.* CII, 147. My observations furnish no decisive evidence in the matter.

$16^h\ 20^m\ 47^s$ —19° 11′.5

Peters announced the variability, *A.N.* XCIX, 120. My observations indecisive. Parkhurst says he has never been able to see this star, and he mentions it, in a private letter, as one of the three stars of Peters which he has not yet been able to confirm.

$18^h\ 1^m\ 54^s$ +28° 44′.4

o Herculis. See my note, *H.C.O. Annals*, XIV, Part II, p. 464, No. 3048.

$19^h\ 9^m\ 53^s$ —19° 19′.4

Safarik thinks his observations show variability between 9.4 and 10.1. Near *S Sagittarii*, with which he confounded it, when first undertaking to observe the latter.

$19^h\ 15^m\ 13^s$ +17° 23′.1

Espin's suggestion of variability is very likely correct, although my observations do not yet confirm it certainly.

$19^h\ 26^m\ 15^s$ +17° 26′.0

I have given the evidence which, it seems to me, render the variability almost certain, in the *Science Observer*, Nos. 43–44, Vol. IV. It lies $0^s.7$ foll., north 2′.2, DM. +17.3997. I have looked for it at least fifty times unsuccessfully, when it must have been below 13.

$19^h\ 27^m\ 13^s$ —25° 2′.0

Gould thinks variable between limits wider than 5.3 to 6.7. Sawyer has three observations in 1882, 1886 and 1887, giving accordantly 5.9 or 6.0.

$19^h\ 55^m\ 18^s$ +30° 25′.6

Espin suggests variability. Not yet confirmed.

$20^h\ 5^m\ 3^s$ +47° 25′.4

Espin alleges variability, 7.7 to 8.9. My estimates so far perfectly accordant, 8.9 or 9.1.

$20^h\ 8^m\ 7^s$ +38° 17′.4

Espin alleges variability, 6.6 to 8.0. My observations indicate that there is some possibility of change, but the star is close to another, and difficult to adjudge properly.

$20^h\ 8^m\ 37^s$ —21° 45′.6

Safarik thinks his observations show fluctuation of six-tenths of a magnitude. Secchi had previously marked it "var.?" in his *Prodromo*.

$20^h\ 23^m\ 34^s$ +39° 29′.9

Espin alleged variability, 7.9 to 9.2; afterwards, in 1886, found it practically invariable.

$20^h\ 38^m\ 50^s$ +17° 34′.0

D'Arrest suspected variability, and my observations in 1886 and 1888, lead me to believe it may possibly be subject to it. Gore asserts a period of perhaps 111 days.

$21^h\ 1^m\ 37^s \quad +47°\ 3'.9$

ESPIN alleges as variable from 4.7 to 6.0, in long or irregular period; but my observations, some of them nearly coincident in date with his, contradict them and give no support to the idea of fluctuation. SAWYER also thinks the star is constant. The star is very red, and difficult to observe; one of those likely to deceive an inexpert or uncritical observer.

$22^h\ 28^m\ 17^s \quad -8°\ 20'.8$

HIND suspected the variability, and SCHÖNFELD was inclined to think it not improbable. See *A.N.* LXIV, 176. Also *Nature*, XXX, 346. I am observing the star, but cannot yet say anything definite with regard to it.

$23^h\ 39^m\ 0^s \quad +2°\ 40'.8$

GOULD was inclined to suspect variability, and other evidence seems to accord with the idea. See my note *H.C.O. Annals*, XIV, Part II, p. 474, No. 4198. My observations in 1885 and 1886 do not confirm, and I am strongly of opinion that the red color is responsible for much, if not all, of the observed contradiction in the estimates, made under different circumstances.

$23^h\ 53^m\ 54^s \quad +59°\ 33'.1$

SECCHI marked this as "var.?" My own observations in 1875 led me independently to suspect it, at first, but I afterwards concluded that the trouble lay entirely in the difficulty of estimating properly this very red star so close to a bluish companion.

In assigning ARGELANDER's letters the rubrics of SCHÖNFELD and WINNECKE have been observed. In *Virgo* and *Cygnus* the alphabet is exhausted, and the extension of the notation under the suggestion of HARTWIG, favored by SCHÖNFELD, is begun by designating No. 5037 of the catalogue as *RR Virginis*, and No. 7456 as *RR Cygni*.

OBSERVED MAXIMA OF TELESCOPIC VARIABLES,

BY PAUL S. YENDELL.

S Coronae, 1888.

A projection of the light-curve from a series of 32 observations of this variable, extending from March 17 to June 9, 1888, indicates a maximum about April 21. No record of estimates of magnitude has been kept, but on July 14 it was estimated to be about $8^M.5$.

R Leonis, 1888.

34 observations of *R Leonis* were secured between March 7 and June 18, 1888, and a maximum is indicated about June 1; but little weight is attached to this determination, as the observations after maximum are few, and were obtained with difficulty, on account of the approach of the star to the sun. The maximum was a tolerably bright one, the star at this phase being = 18 *Leonis*, or 6.2 magnitude. The observations were begun with my $4\frac{1}{4}$-inch Clacey telescope, power 36, and continued from May 7 with a field-glass, a careful comparison of observations with both at this date establishing a definite connection in the light-scale.

S Ursae Majoris.

Observations of this star extended from March 17 to July 14, numbering in all 23, and showing a maximum on June 15. When first seen it was estimated to be of the 11 magnitude. The increase was irregular, being interrupted by sharp fluctuations, and rising after June 1 quite suddenly to the maximum, at which point its light is estimated to have been about 7.5 magnitude. The decrease has been rapid and apparently regular; at the last observation the star's light was estimated as 8.5 magnitude. All the observations were made with the $4\frac{1}{4}$-inch Clacey glass.

Dorchester, Mass., 1888 *July* 16.

NEW COMET, 1888 *e* (*BARNARD*, *September* 2).

A dispatch from Prof. E. S. HOLDEN announces the discovery of a comet at the LICK Observatory, by Prof. E. E. BARNARD. Its position September $3^d.023437$ Greenwich M.T. was following $58^s.07$, south $8'\ 1''$, the DM. star $11°.1377$. It is described as circular; one minute in diameter; eleventh magnitude; with a tolerably well defined nucleus. No decided motion observed in twenty minutes.

An approximate reduction of the observation gives the comet's place about,

$$\alpha = 6^h\ 52^m\ 17^s \qquad \delta + 10°\ 59'.3.$$