

## APPENDIX

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### A List of Early-Type Shell Stars

The following table lists many of the hotter stars whose spectra have occasionally or continuously exhibited moderately conspicuous shell phenomena. It includes such well-known objects as P Cygni,  $\gamma$  Cassiopeiae,  $\beta$  Lyrae and R Monocerotis as well as a host of other less-studied and less-well-understood objects. Novae, classical T Tauri, VV Cephei and symbiotic stars, and stars situated outside the Galaxy have been excluded. The list is undoubtedly very incomplete: many weak or uncertain cases have been left out. It should be remembered that shell phenomena are notoriously variable in time and, in the binaries, often periodically so; thus inclusion in the list does not guarantee that an entry will exhibit shell structure at any specific time.

An attempt has been made to distinguish between the objects whenever possible: category (1) includes Of stars and O, B, and A supergiants showing P Cygni profiles; (2) includes presumably single rapidly rotating stars of classes O, B, A and F; (3) contains stars deemed to be binary, though the shell phenomena may not always be related to this fact; and (4) is devoted to the early-type nebular objects. In many cases assignment to a particular group is very uncertain or impossible, and in the absence of fairly definite evidence to the contrary stars have generally been assigned to category (2). Many of the brighter Be stars have been found to have variable radial velocity, but they have not been considered to be binaries unless a period has been determined.

A single reference, not always the most recent, has been given for each entry. The reader is strongly urged to consult the various bibliographies of emission-line objects for additional important data. Magnitudes are visual unless underlined; some useful information has been omitted for lack of space. 'K' numbers refer to the suspected variable catalogues, 'Carlson' to his 1968 Northwestern U. Dissertation. A few references are given to unpublished data from several other investigators.

The writer is happy to acknowledge that this work, while largely completed in Cleveland, was put into final form while he was serving as Visiting Professor in the Department of Geophysics and Astronomy of the University of British Columbia in January 1976.

## EARLY-TYPE SHELL STARS

Category	Name	Catalogue designation	$\alpha(1900)$	$\delta$	Magnitude	Reference <sup>a</sup>	Notes
			h m	° ′			
1	K 102301	HD 108	0 0.9	+63 7	7.4	A + A 29, 171	Of star
2	HR 10	HD 256	0 2.2	-17 57	6.2	ApJ 182, 809	A star
3	SX Cas	+54 7	0 5.5	+54 20	9.7-11.2	ApJ 99, 89	P = 36.6 d
3	K 100007	HD 698	0 6.3	+57 39	7.1	ApJ 108, 537	P = 55.9 d
2	MWC 5	+61 39	0 14.8	+61 54	8.5	ApJ 97, 217	
?	VX Cas		0 25.7	+61 27	10.7-13.3	Asr 9, 104	
2	MWC 419	+61 154	0 37.5	+61 22	10.6	ApJ 173, 353	
2	$\sigma$ Cas	HD 4180	0.39.2	+47 44	4.5	A + A 18, 106	
2	$\gamma$ Cas	HD 5394	0 50.7	+60 11	1.6-3.0	ApJ 98, 153	
3	U Cep	HD 5679	0 53.4	+81 20	6.6-9.8	DAO 14, 191	P = 2.5 d
2	MWC 10	HD 6343	0 59.4	+65 26	7.1	DDO 2, 315	
2	LS+58° 26		1 8.9	+57 46	11.2	ApJ 137, 547	
2		+57 240	1 12.3	+57 51	9.5	ApJS 2, 389	HD 236689
3	AQ Cas	+61 242	1 12.6	+61 51	10.0-11.0	ApJ 104, 253	P = 11.7 d
2	MWC 426	HD 9709	1 30.0	+46 36	7.0	ApJ 145, 121	
2	$\alpha$ Eri	HD 10144	1 34.0	-57 45	0.5	ApJ 157, 313	
3	$\phi$ Per	HD 10516	1 37.4	+50 11	4.1	ApJ 98, 153	P = 126.6 d
2	$\epsilon$ Cas	HD 11415	1 47.2	+63 11	3.4	ApJS 17, 371	K 100141
2	MWC 23	HD 12302	1 55.6	+59 12	8.0	ApJ 119, 496	
2	MWC 26	HD 12882	2 1.1	+64 34	7.5	Ric A 8, 353	
1	HR 618	HD 12953	2 1.7	+57 57	5.6	ApJ 182, 523	MWC 436
2	MWC 702	+55 521	2 2.1	+55 43	9.8	ApJ 154, 933	
2	V351 Per	HD 13051	2 2.6	+56 31	8.7 <sub>v</sub>	ApJ 154, 933	MWC 27
2	MWC 706	HD 13590	2 7.6	+63 33	7.9	Ric A 8, 353	
2	MWC 29	HD 13661	2 8.1	+54 4	8.6	ApJ 154, 933	
2	MWC 707	HD 13669	2 8.2	+55 20	7.9	ApJ 154, 933	
2	V358 Per	HD 13890	2 10.2	+56 19	8.5-8.6	ApJ 154, 933	MWC 443
?	VZ Cet	$\sigma$ Cet(B)	2 14.3	- 3 26	9.5-12	ApJS 1, 39	MWC 35
2	MWC 36	+56 563	2 14.7	+56 40	9.4	ApJ 154, 933	
2	MWC 710	+56 579	2 15.2	+57 11	9.5	ApJ 154, 933	
1	9 Per	HD 14489	2 15.3	+55 23	5.2	ApJ 182, 523	
1		HD 14535	2 15.8	+56 47	7.5	Bidelman	
2	MWC 46	+56 624	2 19.6	+56 39	9.6	ApJ 154, 933	
2	V529 Cas	HD 15238	2 22.2	+60 13	8.4	ApJ 119, 496	MWC 47
2	V528 Cas	HD 15239	2 22.2	+60 12	8.2	ApJ 119, 496	
2	HR 716	HD 15253	2 22.4	+55 5	6.6	PASP 80, 685	A star
2	MWC 49	HD 15472	2 24.4	+70 31	7.9	DDO 2, 315	
2	MWC 451	+55 643(B)	2 26.2	+55 52	9.8	ApJ 101, 224	
2	MWC 51	+60 510	2 26.3	+60 34	9.0	ApJ 98, 91	
2	MWC 717	HD 15963	2 28.9	+57 38	8.0	ApJ 154, 933	
3	RY Per	HD 17034	2 39.0	+47 43	8.5-10.7	ApJ 104, 396	P = 6.9 d
2	MWC 59	+60 606	2 51.5	+60 12	9.1	PASP 86, 558	
2	HR 894	HD 18552	2 53.8	+37 45	5.9	ApJ 145, 121	MWC 455
3	RX Cas	+67 244	2 58.8	+67 11	8.6-9.5	ApJ 99, 295	P = 32.3 d
2	MWC 61	HD 19243	3 0.7	+62 0	6.7	DDO 2, 315	
2	MWC 63	HD 20017	3 7.9	+48 19	7.9	DDO 2, 315	
2	HR 985	HD 20336	3 11.2	+65 17	4.8	ApJ 137, 1085	K 100264
2		+49 916	3 17.1	+49 17	9.5	ApJS 2, 389	
2	HR 1051	HD 21551	3 23.5	+47 46	5.8	ApJ 136, 381	
2	MWC 727	HD 21641	3 24.5	+47 31	6.8	ApJ 145, 121	
2	MWC 68	HD 21650	3 24.6	+41 23	7.3	DDO 2, 315	
2	$\psi$ Per	HD 22192	3 29.4	+47 52	4.2	Mich 4, 175	MWC 69
2	13 Tau	HD 23016	3 36.5	+19 23	5.5	AJ 65, 535	
2		HD 23478	3 40.4	+32 0	6.6	A + A 33, 473	

## Early-type Shell Stars (continued)

Category	Name	Catalogue designation	$\alpha(1900)$		$\delta$	Magnitude	Reference <sup>a</sup>	Notes
			h m	° ' "				
2	HR 1160	HD 23552	3 41.0	+50 26	6.1	<i>ApJ</i> 145, 121	MWC 464	
2	$\eta$ Tau	HD 23630	3 41.5	+23 48	2.9	<i>MN</i> 113, 477	MWC 74	
2	BU Tau	HD 23862	3 43.3	+23 50	4.8–5.5	<i>ApJ</i> 115, 145	MWC 75	
2	MWC 76	HD 23982	3 44.4	+63 11	8.0	<i>DDO</i> 2, 315		
3	RW Tau	HD 25487	3 57.8	+27 51	8.0–12.5	<i>ApJ</i> 110, 438	$P = 2.8$ d	
3	K 377	HD 25799	4 0.3	+32 6	7.0	<i>ApJ</i> 137, 791	$P = 10.7$ d	
2	HR 1289	HD 26356	4 5.0	+83 34	5.4	<i>ApJ</i> 196, 773		
2	MWC 82	HD 26420	4 5.7	+41 52	7.9	<i>DDO</i> 2, 315		
2	MWC 83	HD 26906	4 10.1	+45 59	7.9	<i>DDO</i> 2, 315		
3	RW Per	+41 851	4 13.3	+42 4	9.7–11.4	<i>ApJ</i> 102, 74	$P = 13.2$ d	
2	HR 1423	HD 28497	4 24.5	–13 16	5.6	<i>DDO</i> 2, 315	MWC 86	
2	Hen 4	HD 29557	4 34.1	–24 52	8.6	<i>AJ</i> 78, 687		
2	HR 1500	HD 29866	4 37.3	+40 36	6.1	<i>DDO</i> 2, 315	MWC 88	
3	KS Per	HD 30353	4 41.8	+43 6	7.6–7.8	<i>PASJ</i> 24, 495	$P = 363.5$ d	
3	RS Cep		4 48.6	+80 6	10.2–11.9	<i>ApJ</i> 104, 253	$P = 12.4$ d	
4	AB Aur	HD 31293	4 49.4	+30 23	7.2–8.4	<i>ApJ</i> 173, 353	MWC 93	
?	MWC 480	HD 31648	4 52.4	+29 41	7.5	<i>ApJ</i> 119, 501		
1 + 3	$\epsilon$ Aur	HD 31964	4 54.8	+43 40	2.9–3.8	<i>JRASC</i> 43, 15	$P = 27.1$ yr	
?	UX Ori	–4 1029	4 59.5	– 3 56	8.7–12.8	<i>Ast</i> 9, 104	HD 293782	
3	103 Tau	HD 32990	5 2.0	+24 8	5.5	A + A 40, 203	$P = 58.3$ d	
2	105 Tau	HD 32991	5 2.0	+21 34	5.8	<i>ApJ</i> 143, 285	MWC 98	
2	K 100452	HD 33232	5 3.8	+40 53	8.2	<i>ApJ</i> 128, 61	MWC 100	
2	$\lambda$ Eri	HD 33328	5 4.4	– 8 53	4.3	<i>ApJ</i> 196, 773	K 100453	
2	MWC 101	HD 33461	5 5.2	+41 6	7.8	<i>DAO</i> 12, 1		
2	Hen 6	HD 33599	5 6.2	–61 56	8.3	<i>MemRAS</i> 75, 1		
2	12 Aur	HD 33988	5 9.0	+46 18	6.9	<i>AN</i> 279, 19	MWC 104	
3	MWC 490	+33 997	5 11.2	+33 56	10.3	<i>ApJ</i> 115, 154	HD 242257	
2	MZ Aur	HD 34626	5 13.8	+36 32	8.0–8.1	A + A 33, 473		
2	HR 1761	HD 34959	5 16.0	+ 3 55	6.6	<i>ApJS</i> 17, 371		
2	HR 1772	HD 35165	5 17.7	–34 27	6.1	<i>Obs</i> 73, 86	Hen 7	
?	HR 1786	HD 35407	5 19.4	+ 2 16	6.3	<i>ApJ</i> 196, 773		
2	25 Ori	HD 35439	5 19.6	+ 1 45	4.9	<i>Mich</i> 4, 169	K 6170	
2		HD 35502	5 20.0	– 2 54	7.4	<i>ApJ</i> 136, 381		
2	120 Tau	HD 36576	5 27.6	+18 28	5.5	<i>AN</i> 277, 167	MWC 111	
4	T Ori	–5 1329	5 30.9	– 5 32	9.5–12.6	<i>ApJS</i> 4, 337	MWC 763	
2	K 100617	HD 37115	5 31.0	– 5 41	7.1	<i>DDO</i> 2, 315	MWC 114	
?	BN Ori	+6 971	5 31.1	+ 6 46	9.0–13.7	<i>Ast</i> 9, 104	HD 245465	
3	$\zeta$ Tau	HD 37202	5 31.7	+21 5	2.9–3.0	A + A 4, 341	$P = 132.9$ d	
4	BF Ori	–6 1259	5 32.3	– 6 39	9.8–13.4	<i>ApJ</i> 174, 401		
4	RR Tau	+26 887a	5 33.3	+26 19	10.2–14.2	<i>ApJ</i> 173, 353	HD 245906	
2	MWC 120	HD 37806	5 36.0	– 2 46	7.9	<i>ApJ</i> 98, 91		
2	HR 1962	HD 37971	5 37.2	–16 46	6.2	<i>ApJS</i> 17, 371		
2	MWC 776	+26 954	5 41.2	+26 22	10.8	<i>ApJ</i> 110, 387	HD 247525	
2		HD 38708	5 42.6	+29 6	8.2	<i>ApJS</i> 2, 389		
2	MWC 779	HD 39018	5 44.7	+18 0	7.5	Bidelman		
2	$\beta$ Pic	HD 39060	5 44.9	–51 6	3.8	<i>ApJ</i> 197, 137	A star	
2	MWC 781	+28 920	5 45.6	+28 14	9.2	<i>ApJ</i> 110, 387	HD 248411	
2		+32 1146	5 53.0	+32 53	8.8	<i>ApJS</i> 2, 389	HD 249845	
2	MWC 786	+25 1065	5 53.8	+25 5	9.1	<i>ApJS</i> 2, 389	HD 250028	
3	DN Ori	HD 40632	5 55.0	+10 13	9.8–10.9	<i>PASP</i> 76, 210	$P = 13.0$ d	
4	MWC 789	+16 974	5 56.2	+16 31	9.7	<i>ApJ</i> 173, 353	HD 250550	
3	HR 2142	HD 41335	5 59.4	– 6 42	5.2	<i>PASP</i> 84, 334	$P = 81$ d	
3	17 Lep	HD 41511	6 0.5	–16 29	4.9	<i>ApJ</i> 143, 121	$P = 276$ d	
4	Lk 208		6 1.9	+18 40	12.7	<i>ApJS</i> 4, 337		

## Early-type Shell Stars (continued)

Category	Name	Catalogue designation	$\alpha$ (1900)	$\delta$	Magnitude	Reference <sup>a</sup>	Notes
			h m	° ′			
2	HR 2174	HD 42111	6 3.7	+ 2 31	5.7	PASP 80, 685	A star
2	MWC 523	HD 42908	6 8.2	+ 8 44	8.2	ApJ 98, 91	
2	MWC 803	HD 44351	6 16.3	+14 21	8.5	ApJ 116, 501	
2	MWC 527	+11 1179	6 21.3	+10 59	9.0	Bidelman	HD 257366
2	MWC 140	HD 45314	6 21.6	+14 57	6.6	Bidelman	
2	$\nu$ Gem	HD 45542	6 23.0	+20 17	4.2	AN 277, 167	
2		HD 45626	6 23.4	- 4 24	9.4	ApJS 2, 41	
?	FS CMa	HD 45677	6 23.7	-12 59	7.6-8.5	A + A 26, 443	MWC 142
2	$\beta$ Mon(A)	HD 45725	6 24.0	- 6 58	4.7	A + A 22, 203	MWC 143
2	HR 2364	HD 45871	6 24.9	-32 18	5.8	ApJ 157, 313	Hen 13
3	AX Mon	HD 45910	6 25.2	+ 5 56	6.6-6.9	A + SS 30, 481	P = 232.5 d
2		HD 46131	6 26.4	-22 15	7.2	AJ 78, 687	
2	Lk 215		6 27.2	+10 14	10.7	ApJ 173, 353	
2	MWC 149	+8 1388	6 28.1	+ 8 25	8.6	ApJS 2, 389	HD 259597
2	HR 2418	HD 47054	6 31.6	- 5 8	5.5	ApJ 145, 121	MWC 150
3	HR 2422	HD 47129	6 32.0	+ 6 13	6.1	ApJS 4, 157	P = 14.4 d
4	R Mon		6 33.7	+ 8 50	11.3-13.8	ApJ 152, 439	MWC 151
4	V590 Mon		6 35.2	+ 9 53	12.7-14.0	ApJS 4, 337	
2		HD 48914	6 40.7	+ 2 37	7.2	DAO 12, 1	
2	MWC 821	HD 49330	6 42.8	+ 0 53	8.9	ApJ 110, 387	
3	RX Gem	HD 49521	6 43.6	+33 21	9.2-11.2	A + A 38, 225	P = 12.2 d
?	MWC 822	HD 49699	6 44.6	-12 33	7.5	Bidelman	
2	$\kappa$ CMa	HD 50013	6 46.1	-32 24	4.0	PASP 87, 137	K 6509
2		HD 50091	6 46.5	-13 7	8.6	ApJS 2, 41	
?	MWC 158	HD 50138	6 46.7	- 6 51	6.6	ApJ 119, 501	
2	MWC 159	HD 50209	6 47.1	- 0 11	8.4	DDO 2, 315	
2	$\psi^9$ Aur	HD 50658	6 49.1	+46 24	5.8	A + AS 9, 133	MWC 537
3	AU Mon	HD 50846	6 49.8	- 1 15	8.2-9.5	ApJ 101, 235	P = 11.1 d
2	MWC 539	HD 50850	6 49.8	-18 10	9.1	ApJ 98, 153	
2	MWC 100	HD 51354	6 51.9	+18 2	7.1	DAO 5, 1	
?	K 924	HD 51480	6 52.4	-10 42	7.0	PASP 80, 197	MWC 161
4	Z CMa	HD 53179	6 59.0	-11 24	8.8-11.2	ApJ 173, 353	MWC 165
2	MWC 838	HD 54858	7 5.4	- 9 10	8.4	ApJ 116, 501	
2	MWC 839	HD 55806	7 9.4	+ 3 4	8.8	AJ 78, 687	
?	EW CMa	HD 56014	7 10.2	-26 11	4.3-4.6	ApJ 119, 496	MWC 170
2	HR 2787	HD 57150	7 14.8	-36 33	4.7	PASP 77, 376	MWC 173
4	K 1025	-44 3318	7 16.4	-44 24	10.0	PASP 87, 87	Hen 32
2		-17 1952	7 19.0	-18 1	11.6	W + S 1, 1	
2	HR 2819	HD 58155	7 19.2	-31 44	5.4	ApJ 157, 313	
?	MWC 560		7 21.0	- 7 31	12.5	ApJ 98, 153	
	RY Gem	HD 58713	7 21.7	+15 52	8.5-11.3	DAO 8, 235	P = 9.3 d
2	$\beta$ CMi	HD 58715	7 21.7	+ 8 29	2.9	ApJ 119, 146	K 6586
2	FY CMa	HD 58978	7 22.8	-22 53	5.6-5.7	ApJ 119, 496	MWC 179
3		HD 59771	7 26.4	-18 2	9.1	ApJ 115, 154	
2	HR 2911	HD 60606	7 30.2	-36 7	5.6	PASP 77, 376	MWC 183
2	HR 2932	HD 61224	7 33.1	-14 13	6.5	ApJ 145, 121	MWC 849
?		-30 5135	7 45.2	-30 53	9.2v	Bidelman	
3	UX Mon	HD 65607	7 54.4	- 7 14	8.0-8.9	ApJ 106, 255	P = 5.9 d
2	HR 3135	HD 65875	7 55.7	- 2 36	6.5	A + A 3, 485	MWC 190
2	Hen 109	-60 968	7 56.1	-60 33	9.7	AJ 74, 813	
3	XY Pup	HD 67862	8 4.8	-11 42	9.2-11.4	PASP 74, 129	P = 13.8 d
2	MWC 577	HD 68468	8 7.4	-13 52	8.5	ApJ 119, 496	
2	MX Pup	HD 68980	8 9.7	-35 36	4.6-4.9	ApJ 197, 137	MWC 192
2	Hen 150	HD 70461	8 17.0	-26 1	9.6	AJ 78, 687	

## Early-type Shell Stars (continued)

Cate- gory	Name	Catalogue designation	$\alpha$ (1900)		$\delta$	Magnitude	Reference	Notes
			h	m				
2		HD 75485	8	45.1	-76 46	8.0	<i>AJ</i> 78, 687	
?	Hen 209		8	45.4	-45 43	12.2	Carlson	
2		HD 75740	8	46.6	-25 59	10.1	<i>AJ</i> 78, 687	
2		-46 4657	8	47.0	-46 12	10.7	<i>Ast Lett</i> 2, 153	
2	Hen 222	-48 1997	8	48.7	-48 36	10.8	<i>MN</i> 122, 239	
2	67 Cnc	HD 77190	8	55.8	+28 18	6.2	<i>ApJ</i> 182, 809	A star
2	V345 Car	HD 78764	9	4.8	-70 8	4.7	<i>PASP</i> 77, 376	MWC 196
3	S Vel	HD 82829	9	29.5	-44 46	7.7-9.5	<i>ApJ</i> 116, 35	P = 5.9 d
2	Hen 327	-50 2767	9	45.5	-50 41	10.5	<i>MemRAS</i> 72, 239	HD 297625
2	HR 3971	HD 87543	10	0.5	-61 24	6.1	<i>MemRAS</i> 72, 233	Hen 362
?	MWC 198	HD 87643	10	1.1	-58 11	9.1	<i>Ast Lett</i> 2, 153	
2	$\omega$ Car	HD 89080	10	11.4	-69 32	3.3	Bahng	
?	Hen 394	-57 2874	10	11.8	-57 22	8.6	Carlson	
?	MWC 200	HD 89249	10	12.6	-55 6	9.1	Carlson	
?	HR Car	HD 90177	10	19.4	-59 8	8.2-9.6	<i>ApJ</i> 115, 133	MWC 202
2	HR 4123	HD 91120	10	26.1	-13 5	5.6	A + A 3, 485	MWC 205
2	HR 4128	HD 91269	10	27.1	-60 51	6.4	<i>MemRAS</i> 72, 233	Hen 437
2	PP Car	HD 91465	10	28.5	-61 10	3.3-3.4	<i>PASP</i> 77, 376	MWC 208
1	HR 4169	HD 92207	10	33.6	-58 13	5.5	A + SS 23, 431	
2	Hen 462	HD 92406	10	35.0	-58 12	9.1	<i>AJ</i> 78, 687	
2	MWC 216	-60 2160	10	37.6	-60 15	10.1	<i>AJ</i> 75, 703	HD 305483
?	$\eta$ Car	HD 93308	10	41.2	-59 10	0.8-7.9	<i>MN</i> 113, 211	MWC 214
2		HD 93383	10	41.8	-32 47	8.5	<i>AJ</i> 78, 687	
2	Hen 515	HD 94509	10	49.4	-57 54	9.1	<i>AJ</i> 78, 687	
?	Hen 519	-59 3400	10	50.0	-59 55	10	<i>ApJ</i> 115, 133	
3	GG Car	HD 94878	10	52.0	-59 52	9.1-9.5	A + A 34, 333	P = 62.1 d
?	AG Car	HD 94910	10	52.2	-59 55	7.1-9.0	<i>Vis</i> 2, 1380	MWC 216
3	TT Hya	HD 97528	11	8.3	-25 55	7.5-9.5	<i>ApJ</i> 103, 71	P = 7.0 d
2	$\phi$ Leo	HD 98058	11	11.6	- 3 6	4.5	<i>ApJ</i> 182, 809	A star
2	V644 Cen	-60 3278	11	38.3	-60 11	9.5-10.2	<i>ApJ</i> 115, 578	Hen 700
2		HD 104015	11	53.5	-70 11	7.0	<i>MemRAS</i> 77, 199	
2	$\epsilon$ Cha(B)	HD 104237	11	55.1	-77 38	6.6	<i>AJ</i> 78, 687	Hen 741
2	$\delta$ Cen	HD 105435	12	3.2	-50 10	2.6	<i>ZfA</i> 59, 108	K 6892
2	14 Com	HD 108283	12	21.4	+27 49	4.9	<i>DAO</i> 9, 237	A star
?	$\kappa$ Dra	HD 109387	12	29.2	+70 20	3.9	A + A 11, 100	K 101294
2	HR 4804	HD 109857	12	32.8	-74 49	6.5	<i>MemRAS</i> 72, 233	Hen 802
2	HR 4893	HD 112028	12	48.4	+83 57	5.3	<i>ApJ</i> 138, 118	A star
2	24 CVn	HD 118232	13	30.4	+49 32	4.7	<i>ApJ</i> 182, 809	A star
2	$\mu$ Cen	HD 120324	13	43.6	-41 59	2.9-3.4	<i>PASP</i> 52, 198	MWC 229
2	47 Hya	HD 121847	13	52.9	-24 29	5.2	<i>ApJ</i> 175, 453	
2	$\eta$ Cen	HD 127972	14	29.1	-41 43	2.3	<i>ZfA</i> 59, 108	K 7142
2	Hen 1034	HD 130903	14	45.6	-40 24	7.6	<i>AJ</i> 78, 687	
2	Hen 1042	HD 131891	14	51.1	-72 19	8.3	<i>AJ</i> 78, 687	
?	V748 Cen	-32 10517	14	53.5	-33 1	11-<13	<i>Obs</i> 91, 112	Hen 1045
2	K 7170	HD 133738	15	0.9	-61 30	7.0	<i>TrIAU</i> 12A, 442	Hen 1050
2	Hen 1051	HD 133901	15	1.8	-50 47	9.2	<i>AJ</i> 78, 687	
2		HD 134783	15	6.6	-53 46	9.2	<i>MN</i> 122, 239	
3	U CrB	HD 136175	15	14.1	+32 1	7.0-8.4	<i>ApJ</i> 102, 480	P = 3.5 d
2	$\kappa^1$ Aps	HD 137387	15	20.6	-73 3	5.5	<i>ApJ</i> 157, 313	MWC 235
3	$\gamma$ UMi	HD 137422	15	20.9	+72 11	3.0	<i>ApJ</i> 116, 541	K 101502
2	HR 5736	HD 137432	15	20.9	-36 25	5.4	<i>ApJ</i> 157, 313	
?	MWC 236	HD 138403	15	26.7	-71 35	10.0	<i>Vis</i> 2, 1380	
2	$\nu^2$ Boo	HD 138629	15	28.2	+41 14	5.0	<i>ApJ</i> 182, 809	A star
2	HR 5781	HD 138769	15	29.0	-44 37	4.5	<i>ApJ</i> 157, 313	

## Early-type Shell Stars (continued)

Category	Name	Catalogue designation	$\alpha(1900)$		$\delta$	Magnitude	Reference <sup>a</sup>	Notes
			h	m				
2		HD 140605	15	39.4	-51 50	7.1	<i>MemRAS</i> 67, 51	
3	4 Her	HD 142926	15	52.2	+42 51	5.8	A + A 22, 337	P = 46.0 d
2	FX Lib	HD 142983	15	52.6	-13 59	4.8-5.0	<i>Ast Lett</i> 8, 45	MWC 239
4	RY Lup		15	52.7	-40 5	9.9-13.0	<i>ApJ</i> 174, 401	
2	Hen 1138	-52 9243	15	59.3	-52 47	9.3	Carlson	
2	V856 Sco	HD 144667	16	1.9	-38 50	7.5-7.8	<i>ApJ</i> 177, 209	
2		-44 10777	16	13.1	-44 53	9.6	<i>AJ</i> 78, 687	
2	25 Her	HD 148283	16	21.8	+37 37	5.5	<i>ApJ</i> 182, 809	A star
3	R Ara	HD 149730	16	31.4	-56 48	6.0-6.9	<i>ApJ</i> 116, 27	P = 4.4 d
2	$\zeta$ Oph	HD 149757	16	31.7	-10 22	2.6	<i>ApJ</i> 188, L19	
1	HR 6245	HD 151804	16	44.6	-41 4	5.3	<i>ApJ</i> 100, 189	Of-star
2	Hen 1264	HD 151873	16	45.0	-56 52	8.8	<i>AJ</i> 78, 687	
1	$\zeta^1$ Sco	HD 152236	16	47.0	-42 12	4.7	<i>ApJ</i> 186, 909	K 7518
1	Hen 1278	HD 152386	16	47.9	-44 50	8.1	MacConnell	Of star
4	AK Sco	HD 152404	16	48.0	-36 43	8.8-10.3	<i>ApJ</i> 174, 401	
1	HR 6272	HD 152408	16	48.0	-41 0	5.8	<i>ApJ</i> 100, 189	Of star
2	HR 6274	HD 152478	16	48.4	-50 31	6.3	<i>ApJ</i> 117, 313	Hen 1282
?	MWC 873	-40 11253	17	8.3	-40 13	9.6	<i>ApJ</i> 115, 133	HD 327083
2	MWC 253	HD 155851	17	9.0	-32 34	8.2	<i>ApJ</i> 97, 194	
2	HR 6507	HD 158352	17	23.7	+ 0 25	5.4	<i>ApJ</i> 182, 809	A star
2	$\alpha$ Ara	HD 158427	17	24.1	-49 48	2.9	<i>ZfA</i> 59, 109	MWC 261
3	Hen 1419	HD 158503	17	24.5	-58 29	8.3	<i>IAUC</i> 2130	
4	AS 232		17	27.1	-39 19	11.0	<i>AJ</i> 80, 212	HD 323771
2	MWC 263	HD 160095	17	32.9	-33 30	8.7	<i>ApJ</i> 72, 98	
1	MWC 266	HD 160529	17	35.3	-33 27	6.7	<i>ApJ</i> 91, 592	
?	XX Oph	HD 161114	17	38.6	- 6 13	9.1-11.1	<i>ApJ</i> 133, 503	MWC 269
2		HD 161261	17	39.4	+ 5 46	8.3	<i>ApJ</i> 139, 1139	
?	MWC 272	-27 11944	17	41.9	-27 59	9.6	<i>ApJ</i> 93, 349	HD 316285
2	MWC 594	HD 162428	17	45.9	+24 30	7.0	<i>ApJ</i> 145, 121	
2	V771 Sgr	HD 162718	17	47.3	-25 45	8.9-9.4	<i>ApJ</i> 94, 353	MWC 273
3	88 Her	HD 162732	17	47.4	+48 25	6.4	A + A 33, 117	P = 86.6 d
?	MWC 275	HD 163296	17	50.3	-21 56	6.6	<i>ApJ</i> 72, 98	
2	V2048 Oph	HD 164284	17	55.3	+ 4 22	4.6-4.8	A + A 3, 485	MWC 278
2	HR 6720	HD 164447	17	56.1	+19 31	6.4	<i>ApJ</i> 110, 387	MWC 279
1+3	$\mu$ Sgr	HD 166937	18	7.8	-21 5	3.8-3.9	<i>ApJ</i> 186, 909	P = 180.6 d
2	HR 6819	HD 167128	18	8.7	-56 3	5.3	<i>ApJ</i> 157, 313	
1	MWC 291	HD 168607	18	15.5	-16 25	8.3	<i>PASP</i> 52, 401	
2	HR 6873	HD 168797	18	16.5	+ 5 24	6.1	A + AS 9, 133	MWC 601
2		HD 168936	18	17.2	-17 43	8.1	<i>AJ</i> 78, 687	
2	MWC 292	HD 168957	18	17.3	+25 1	7.0	<i>DDO</i> 2, 315	
1	MWC 293	HD 169226	18	18.6	-12 15	9.1	<i>ApJ</i> 99, 205	
1	MWC 294	HD 169454	18	19.6	-14 2	6.6	<i>ApJ</i> 72, 98	
3	RY Sct	HD 169515	18	19.9	-12 45	9.7-10.3	<i>ApJ</i> 97, 394	P = 11.1 d
3	RZ Sct	HD 169753	18	21.1	- 9 15	7.3-8.8	<i>ApJ</i> 130, 791	P = 15.1 d
?	HR 6929	HD 170235	18	23.2	-25 19	6.6	<i>ApJ</i> 157, 313	MWC 299
?	MWC 300		18	24.0	- 6 9	10.0	<i>ApJS</i> 4, 337	
?		HD 170682	18	25.6	-19 14	7.9	<i>Obs</i> 87, 286	in M 25
2	MWC 938	HD 171219	18	28.4	+ 5 22	8.0	<i>ApJ</i> 145, 121	
2	HR 6984	HD 171780	18	31.6	+34 22	6.1	Bidelman	MWC 604
2	MWC 303	HD 172694	18	36.5	-15 57	8.1	<i>ApJ</i> 115, 47	
3	MWC 304	HD 173219	18	39.2	- 7 13	7.8	<i>MN</i> 163, 219	P = 58.4 d
2	4 Aql	HD 173370	18	39.8	+ 1 57	5.0	<i>ApJ</i> 196, 773	K 101758
2	MWC 956	HD 173371	18	39.8	- 0 28	6.8	<i>ApJ</i> 145, 121	
2	MWC 305	HD 174105	18	43.8	+15 17	6.9	<i>ApJ</i> 145, 121	

## Early-type Shell Stars (continued)

Category	Name	Catalogue designation	$\alpha(1900)$		$\delta$	Magnitude	Reference <sup>a</sup>	Notes
			h	m				
2	HR 7081	HD 174179	18 44.2	+31 39	5.8	<i>ApJS</i> 17, 371		
2	HR 7084	HD 174237	18 44.5	+52 53	5.9	<i>AN</i> 277, 179	MWC 608	
3	$\beta$ Lyr	HD 174638/9	18 46.4	+33 15	3.3–4.3	<i>BAC</i> 25, 6	$P = 12.9$ d	
2	MWC 308	HD 175863	18 52.3	+59 53	7.1	<i>A + AS</i> 9, 133		
4	TY CrA	-37 13024	18 54.9	-37 1	8.7–12.4	<i>ApJ</i> 174, 401		
4	R CrA	-37 13027	18 55.1	-37 6	10.0–14.0	<i>T + T</i> 5, 107		
2	MWC 973	HD 177291	18 58.9	-18 51	8.7	<i>ApJ</i> 119, 496		
2	MWC 310	HD 177648	19 0.5	+23 11	7.2	<i>A + AS</i> 9, 133		
2	MWC 978	HD 179343	19 7.1	+ 2 27	7.0	<i>ApJ</i> 118, 18		
2	MWC 312	HD 180398	19 11.3	+12 56	7.9	<i>DDO</i> 2, 315		
2		HD 180587	19 12.0	+10 49	8.6	<i>MemRAS</i> 68, 173		
3	U Sge	HD 181182	19 14.4	+19 26	6.6–9.2	<i>ApJ</i> 114, 513	$P = 3.4$ d	
4	AS 353		19 15.6	+10 51	11.5	<i>ApJ</i> 174, 401		
3	$\nu$ Sgr	HD 181615/6	19 16.0	-16 9	4.3–4.4	<i>PASJ</i> 19, 564	$P = 137.9$ d	
?	MWC 314	+14 3887	19 17.0	+14 42	10.0	<i>ApJ</i> 97, 226		
2	MWC 985	+30 3526	19 17.8	+30 58	9.2	<i>ApJ</i> 116, 501		
?	WW Vul	+20 4136	19 21.7	+21 1	10.2–11.8	<i>Ast</i> 9, 104	HD 344361	
2	HR 7403	HD 183362	19 24.1	+37 44	6.4	<i>AN</i> 279, 19	MWC 318	
2	V923 Aql	HD 183656	19 25.5	+ 3 14	6.3–6.4	<i>ApJ</i> 116, 501	MWC 988	
2	V1294 Aql	HD 184279	19 28.6	+ 3 33	6.8–7.2	<i>ApJ</i> 115, 47	MWC 319	
2	11 Cyg	HD 185037	19 32.2	+36 43	5.9	<i>ApJ</i> 145, 121	MWC 619	
2	LS+22° 8		19 35.9	+22 18	11.8	<i>ApJ</i> 137, 547		
3	MWC 321	HD 187399	19 44.7	+29 9	7.7	<i>MN</i> 163, 209	$P = 28.0$ d	
2	MWC 995	+32 3583	19 45.7	+32 42	9.1	<i>ApJS</i> 2, 389	HD 225985	
?	AS 363	+26 3687	19 46.9	+26 53	9.4	<i>ApJS</i> 1, 220	HD 338970	
2		HD 187851	19 47.0	+27 27	7.7	<i>A + A</i> 40, 203		
?	9 Sge	HD 188001	19 47.9	+18 25	6.2	<i>DAO</i> 11, 143	K 102965	
2	AS 372	+16 4079	19 53.1	+17 6	9.0	<i>ApJ</i> 116, 501	HD 351123	
?	V1295 Aql	HD 190073	19 58.1	+ 5 28	8.6v	<i>ApJ</i> 113, 55	MWC 325	
2	MWC 998	HD 190150	19 58.5	+21 34	8.0	<i>ApJ</i> 145, 121		
1	HR 7678	HD 190603	20 0.7	+31 56	5.6	<i>DAO</i> 9, 1	MWC 326	
?	V425 Cyg	+35 3981	20 4.3	+35 50	9.8–10.4	<i>ApJ</i> 131, 632	MWC 628	
2	20 Vul	HD 192044	20 7.8	+26 11	5.9	<i>DDO</i> 2, 315	MWC 331	
3	KU Cyg		20 9.6	+47 5	11.5–13.8	<i>ApJ</i> 139, 143	$P = 38.4$ d	
2	21 Vul	HD 192518	20 10.1	+28 23	5.2	<i>ApJ</i> 182, 809	A star	
3	VW Cyg	+34 3938	20 11.4	+34 12	10.4–13.6	<i>ApJ</i> 103, 76	$P = 8.4$ d	
2	MWC 335	HD 192954	20 12.6	+15 34	7.3	<i>ApJ</i> 118, 18		
2	MWC 336	HD 193009	20 12.9	+32 4	7.2	<i>AN</i> 279, 19		
2	MWC 632	HD 193182	20 13.8	+39 17	6.5	<i>ApJ</i> 119, 496		
1	P Cyg	HD 193237	20 14.1	+37 43	3–6	<i>DAO</i> 9, 1	MWC 338	
2	MWC 1011	+29 3982	20 14.1	+30 7	9.1	<i>ApJ</i> 110, 387	HD 334060	
?	MWC 340	+40 4124	20 17.0	+41 3	10.6	<i>ApJ</i> 173, 353		
2	25 Vul	HD 193911	20 17.7	+24 8	5.4	<i>ApJ</i> 145, 121	MWC 341	
2	MWC 342		20 19.4	+39 10	10.6	<i>ApJ</i> 97, 217		
2	HR 7807	HD 194335	20 20.0	+37 9	5.9	<i>AN</i> 277, 167	MWC 343	
2	1 Del	HD 195325	20 25.5	+10 34	5.9	<i>ApJ</i> 128, 61	MWC 1019	
2	MWC 1020	HD 195358	20 25.7	+19 5	6.6	Bidelman		
2	MWC 346	HD 195407	20 26.0	+36 39	7.8	<i>ApJ</i> 128, 61		
2	MWC 1027	HD 197434	20 38.6	+53 51	7.9	<i>ApJ</i> 110, 387		
2	$\lambda$ Cyg	HD 198183	20 43.5	+36 7	4.5	<i>AN</i> 277, 32	MWC 352	
3	V367 Cyg	HD 198287/8	20 44.2	+38 55	7.4–8.0	<i>ApJ</i> 134, 568	$P = 18.6$ d	
?	DV Aqr	HD 199603	20 53.2	-14 52	6.0–6.2	<i>BAAS</i> 7, 543	A star	
2	60 Cyg	HD 200310	20 57.6	+45 46	5.4	<i>DDO</i> 2, 315	MWC 360	
4	V1331 Cyg		20 57.9	+49 58	11.8–12.2	<i>ApJ</i> 140, 1409	LkH $\alpha$ 120	

*Early-type Shell Stars (continued)*

Cate- gory	Name	Catalogue designation	$\alpha$ (1900)		$\delta$	Magnitude	Reference <sup>a</sup>	Notes
			h	m				
4	K 102052	HD 200775	21	0.4	+67 46	7.3	<i>ApJ</i> <b>173</b> , 353	MWC 361
2	HR 8103	HD 201733	21	6.4	+45 6	6.6	<i>ApJS</i> <b>17</b> , 371	MWC 363
2	K 103041	+41 4064	21	12.4	+42 7	9.0	<i>ApJS</i> <b>2</b> , 41	
2	$\nu$ Cyg	HD 202904	21	13.8	+34 29	4.4	<i>PASJ</i> <b>20</b> , 178	MWC 364
3	K 8645	HD 203025	21	14.6	+58 10	6.4	<i>ApJ</i> <b>76</b> , 173	$P = 5.4$ d
2	MWC 1043	HD 203356	21	16.6	+53 32	7.7	<i>ApJ</i> <b>145</b> , 121	
2	6 Cep	HD 203467	21	17.3	+64 27	5.2	<i>Mich</i> <b>4</b> , 175	MWC 367
2	MWC 370	HD 204722	21	25.5	+43 54	7.7	Bidelman	
2	MWC 371	HD 205060	21	27.7	+42 16	7.2	<i>DDO</i> <b>2</b> , 315	
?	$\epsilon$ Cap	HD 205637	21	31.5	-19 55	4.7	<i>MN</i> <b>148</b> , 79	K 8668
2	V1427 Cyg	+47 3487	21	32.2	+47 28	9.1-9.2	<i>ApJ</i> <b>116</b> , 501	MWC 374
3	AQ Peg	+12 4653	21	32.5	+13 2	10.3-13.0	<i>ApJ</i> <b>103</b> , 76	$P = 5.5$ d
?	MWC 376	HD 206773	21	39.3	+57 17	6.9	<i>DDO</i> <b>2</b> , 315	
4	LkH $\alpha$ 234		21	40.8	+65 39	11.9	<i>ApJ</i> <b>173</b> , 353	
2	MWC 377	HD 207232	21	42.4	+50 13	7.0	<i>ApJ</i> <b>145</b> , 121	
4	K 8703	+46 3471	21	48.7	+46 46	10.1	<i>ApJ</i> <b>173</b> , 353	AS 477
2	EM Cep	HD 208392	21	50.9	+62 8	7.0-7.1	Bidelman	MWC 380
2	HR 8375	HD 208682	21	52.9	+64 52	5.9	<i>DDO</i> <b>2</b> , 315	MWC 381
2	MWC 646	+50 3496	21	53.1	+51 6	8.1	<i>ApJ</i> <b>98</b> , 153	HD 235668
2	Hen 1927	HD 208886	21	54.1	-32 0	7.1	<i>AJ</i> <b>78</b> , 687	
3	MR Cyg	+47 3639	21	55.1	+47 30	8.8-9.7	<i>A + A</i> <b>23</b> , 357	$P = 1.7$ d
2	$\eta$ PsA	HD 209014	21	55.1	-28 56	5.4	Bidelman	Hen 1928
2	MWC 1052	+44 4014	21	56.2	+45 7	8.8	<i>ApJ</i> <b>110</b> , 387	
2	MWC 383	HD 209296	21	57.2	+56 14	8.3	<i>DDO</i> <b>2</b> , 315	
2	$\sigma$ Aqr	HD 209409	21	58.1	- 2 38	4.7	<i>ApJ</i> <b>110</b> , 387	K 8738



## Early-type Shell Stars (continued)

Category	Name	Catalogue designation	$\alpha$ (1900)		$\delta$	Magnitude	Reference <sup>a</sup>	Notes
			h	m				
?	MWC 1055		22	4.7	+53 44	12.8	<i>ApJ</i> <b>110</b> , 387	
2	$\pi$ Peg	HD 210459	22	5.5	+32 41	4.3	<i>ApJ</i> <b>117</b> , 269	F star
2	MWC 1056	+52 3147	22	9.8	+53 7	9.4	<i>ApJ</i> <b>110</b> , 387	
2	31 Peg	HD 212076	22	16.6	+11 42	5.0	A + AS <b>9</b> , 133	MWC 387
?	SV Cep	+72 1031	22	19.6	+73 10	10.1–12.6	<i>Ast</i> <b>9</b> , 104	
2	$\pi$ Aqr	HD 212571	22	20.2	+ 0 52	4.7	<i>ApJS</i> <b>7</b> , 65	MWC 388
2	8 Lac	HD 214168	22	31.4	+39 7	5.7	A + A <b>9</b> , 133	K 102192
2		HD 215024	22	37.2	+64 44	8.6	A + A <b>40</b> , 203	
2	HR 8682	HD 216057	22	44.6	+53 53	6.1	<i>ApJ</i> <b>145</b> , 121	MWC 393
2	EW Lac	HD 217050	22	52.7	+48 9	5.0–5.3	A + A <b>19</b> , 224	MWC 394
2	HR 8758	HD 217543	22	56.3	+38 10	6.6	A + AS <b>9</b> , 133	K 103109
2	<i>o</i> And	HD 217675	22	57.3	+41 47	3.5–3.6	<i>ApJ</i> <b>119</b> , 460	
2	MWC 1076	+53 3066	22	59.6	+53 40	8.7	<i>ApJ</i> <b>119</b> , 501	HD 236031
2		HD 218325	23	2.0	+46 23	7.7	<i>ApJS</i> <b>23</b> , 257	
3	MWC 397	HD 218393	23	2.6	+49 39	6.8	A + A <b>11</b> , 100	$P = 38 \pm d$
3		HD 218674	23	4.8	+49 6	6.7	<i>AJ</i> <b>65</b> , 535	
4	MWC 1080		23	12.9	+60 18	13.0	<i>ApJS</i> <b>4</b> , 337	
?	MWC 399	HD 220116	23	16.1	+57 44	8.7	<i>MN</i> <b>155</b> , 357	
2	MWC 1081	HD 220300	23	17.6	+55 48	7.8	<i>ApJ</i> <b>116</b> , 501	
?	R Aqr(B)		23	38.6	–15 50	9±	<i>DAO</i> <b>9</b> , 1	MWC 400
1	6 Cas	HD 223385	23	44.0	+61 40	5.4	<i>DAO</i> <b>14</b> , 107	K 8884
2	MWC 402	HD 223501	23	45.0	+61 40	7.8	<i>DDO</i> <b>2</b> , 315	
2	HR 9068	HD 224544	23	53.7	+31 48	6.5	<i>ApJ</i> <b>110</b> , 387	MWC 406
2	HR 9070	HD 224559	23	53.8	+45 52	6.5	<i>DDO</i> <b>2</b> , 315	K 8901
2	HR 9094(B)	HD 225010	23	57.5	+65 33	7.3	<i>PASP</i> <b>80</b> , 685	A star
2	MWC 409	HD 225095	23	58.3	+55 0	7.9	<i>DDO</i> <b>2</b> , 315	

- <sup>a</sup> A + A = *Astron. Astrophys.*  
A + AS = *Astron. Astrophys. Suppl. Ser.*  
A + SS = *Astrophys. & Space Science*  
AJ = *Astron. J.*  
AN = *Astron. Nachrichten*  
ApJ = *Astrophys. J.*  
ApJS = *Astrophys. J. Suppl. Ser.*  
Ast = *Astrophysics (translation)*  
Ast Lett = *Astrophys. Letters*  
BAAS = *Bull. Amer. Astron. Soc.*  
BAC = *Bull. Astron. Soc. Czechoslovakia*  
DAO = *Publ. Dominion Astrophys. Obs.*  
DDO = *Publ. David Dunlap Obs.*  
IAUC = *IAU Circular*  
JRASC = *J. Roy. Astron. Soc. Canada*  
MemRAS = *Mem. Roy. Astron. Soc.*  
Mich = *Publ. U. of Michigan Obs.*  
MN = *Monthly Notices Roy. Astron. Soc.*  
Obs = *Observatory*  
PASJ = *Publ. Astron. Soc. Japan*  
PASP = *Publ. Astron. Soc. Pacific*  
Ric A = *Ricerche Astronomiche, Specola Vaticana*  
TrIAU = *Transactions IAU*  
T + T = *Bol. Tonantzintla y Tacubaya Obs.*  
Vist = *Vistas in Astronomy*  
W + S = *Publ. Warner & Swasey Obs.*  
ZfA = *Z. Astrophys.*