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COMMUNICATIONS FROM THE OBSERVATORY AT LEIDEN.

New Southern Double Stars, ninth list [1]), by *W. H. van den Bos.*

For a considerable part of the southern sky the survey for double stars at the Union Observatory is now approaching its end, at least so far as the provisional searches are concerned. Its completion near the Milky Way, of the definitive searching according to the severe standard I have set myself and kept up since its beginning and the adequate measurement of the most difficult new and known pairs, will presumably require many more years, because we will have to wait for the nights of fine definition required for this purpose. Even in the favourable climate of South Africa when using a large telescope such nights are none too frequent. I have naturally put to myself the question if the searches should now be extended to fainter stars. After mature consideration I have decided not to do so at present; if in the future, then certainly not to the extent of a complete survey of stars to a magnitude limit fainter than 9·0 C. P. D., and I shall endeavour to give my reasons for that decision.

The limit adopted for the present survey (9·0 C. P. D. with the inclusion of such stars as were indicated in that work as being *visually* not fainter than 9·0) is of course arbitrary; but, apart from the fact that it closely corresponds to the magnitude limit 9·0 B. D. adopted for the Lick survey, it has several points in its favour. The number of stars to be investigated is sufficiently small to allow a thorough survey to be completed in a reasonable time, the discoverer being able to provide a sufficient set of measures for his discoveries and even remeasures at a later epoch. The Lick survey has proved this. As is well known the percentage of pairs of *individual* interest is woefully small even among stars brighter than 9·1, and it quickly decreases for fainter stars. If it is believed that their number down to 9·0 is insufficient for our general astronomical conclusions, it seems much more reasonable to restrict the investigation of fainter stars to objects which at least hold out some promise, such as stars of large proper motion which are found in blink-microscope work, or possibly variable stars. Important pairs such as Kr 60, o_2 Eri BC, μ Her BC, etc., would be picked up in this way with far less trouble than by a general investigation of faint stars. If on the contrary such general searching is done, and is done properly and thoroughly, the end cannot be seen. When moderate telescopes are used the individually interesting stars are likely to be missed, these fainter objects becoming rapidly more and more difficult. If a powerful instrument is used, the number of discoveries will become beyond the capacity of measurement of the discoverer. A search near the Milky Way on a good night at the 26½-inch is enough to prove this beyond doubt. In either case the danger exists that, if such discoveries are included in general catalogues like Burnham, Aitken and Innes, these works will acquire such dimensions that the observer endeavouring to draw up a programme of interesting pairs as well as the statistician using them as a source of information (a source which ought to be practically complete and homogeneous and would be neither) will be lost in them.

Turning now to *statistical* investigations (the birthright of a systematic survey), I have found from sample counts in poor and rich regions that the number of stars 9·1—9·5 in the C. P. D. is roughly equal to the total number down to 9·0. An extension of the limit to 9.5 would therefore mean doubling the time required for the survey. Is the danger of extrapolating statistical conclusions based on a complete material extending from the brightest stars down to 9·0 over the small range 9·1—9·5 sufficiently great to warrant the necessary labour? Would not the statistician be much better served by an equally thorough and complete survey over a wider range of magnitudes in restricted regions such as Kapteyn's Selected Areas?

Unfortunately it cannot be denied that the discovery of double stars, though not to the double-star expert,

[1]) Previous lists: *B. A. N.* III, No. 107, p. 187; No. 111, p. 213; No. 114, p. 229; IV, No. 126, p. 45; No. 139, p. 109; No. 153, p. 235; No. 155, p. 253; V, No. 163, p. 17.

but rather to the astronomer working on different branches of astronomy, has a spectacular glamour which is lacking in a patient, careful series of measures of important and difficult pairs. Nevertheless in my opinion far more credit is due to the latter work. I fully agree with Professor VAN BIESBROECK's decision not to use his opportunities at the 40-inch for searching among the fainter stars now that the Lick survey has been completed, but to measure important pairs requiring great optical power. AITKEN and HUSSEY, when faced with the tremendous task of executing the systematic survey, spent a large part of their observing time in measuring known pairs, often using the rare nights of fine definition for this purpose if the difficulty of the object required such. HUSSEY, when searching at La Plata, started an extensive series of measures of known pairs as soon as he became equipped with a micrometer, leaving many of his own earlier discoveries unmeasured. INNES, after his discoveries with the Cape 7-inch, used the 18-inch for measurement and started his series of measures at Johannesburg as soon as the micrometer became available. With the 26-inch later on he never omitted to measure a known pair encountered in his searches if the pair required measurement. DEMBOWSKI might easily have discovered many pairs found by BURNHAM and others, since he observed them, but I for one prefer the substance of his 20 000 measures. BURNHAM himself made at least that number with the 40-inch, knowing that discovery could safely be left in the hands of HUSSEY and AITKEN. Following the lead of these astronomers I have never allowed the survey to interfere with the urgent measurement of known pairs: at least half of the measures published in *Leiden Annals* XIV, **4**, being of known pairs.

These statements are frankly a personal opinion; if the future will show it to be a mistaken one, I will be glad that work on the fainter stars has already been started by others. At present I cannot see that the history of double-star astronomy leads to such a conclusion, not counting even the development of the photographic methods, which provide a quicker and fuller (proper motion!) way of dealing with the fainter and wider pairs.

The aim of a double-star survey is not primarily the discovery of binaries (physical systems), as is sometimes believed. Star counts and probability show us that the great majority of the double stars listed by the modern discoverers are binaries. But only for a small percentage of our double stars can the binary character be established in individual cases, after a series of careful measures has shown curvilinear motion. This percentage is greatly increased, though still remaining small, by calling to aid the results of proper motion work. I have computed the ratio annual orbital motion: annual proper motion for a few samples of different classes of binaries, taking $2\pi a/P$ as the annual average orbital motion for pairs with computed orbits.

For the three champion visual binaries we have:
ξ UMa Aa 1:1; Dawson 31 AB 1:0·5; δ Equ 1:1.

For three pairs of moderate period:
Kr 60 1:2·7; Sirius 1:1·4; α Cen 1:2·7.

For three long periods:
Bu 7060 1:18; 61 Cyg 1:30; 34 Groombr 1:48.

Beyond this we know a considerable number of pairs for which the ratio is still practically 1 : ∞, as a century of measurement fails to show relative motion, notwithstanding a well established (sometimes considerable) common proper motion. It should therefore be emphasised that in proving binary character the proper motion is much the more powerful criterion. We cannot, however, draw a sharp boundary between a binary, a moving cluster and a star stream, though nobody would describe the Hyades or the Ursa Major stream (including e. g. Sirius) as a multiple star. On the contrary an optical pair may very well be a double star.

The point is: the term "double star" should be understood as independent of physical relationship, as a convention to restrict the activities of the double-star discoverer and observer and to ensure homogeneity for statistical work. The definition itself must depend on the history of double-star astronomy and the development of photography. My personal feeling is that the Lick survey definition serves the purpose very well; I have adopted it for the Union survey. Even though there is no overlap with the pairs seen on Carte du Ciel plates in the case of very unequal magnitudes I believe that in statistical work this small gap could be bridged without any danger. The limits adopted by AITKEN for his extension of BURNHAM's *General Catalogue* on the other hand appear to me to be very generous; he himself states that he would never have adopted them for a systematic survey (the Lick survey would still be unfinished if he had), but looked upon the catalogue as a legacy from BURNHAM and DOOLITTLE. Such works as BURNHAM's and the new *Southern Double-Star Catalogue* have almost the character of an encyclopedia of double-star astronomy. That could be done at the time of their publication. But if this policy is not abandoned in future works of this kind, if the numerous faint pairs that can be found on Carte du Ciel plates (SCHEINER, STEIN, GROOT) are to be included, these works would become unwieldy, probably even useless. I believe that it will be found that a distance limit (depending on apparent magnitude) will be insufficient and that to preserve usefulness and homogeneity an apparent magnitude limit will have to be added. If a pair fainter than 10·0 Harvard visual, or 9·5, or even 9·0 as may be found necessary, or too wide for its magnitude, is included for special reasons, these reasons and the fact of its being outside the limits might be stated in a note for the convenience of the statistical worker.

The combined magnitude for the pairs in this and future lists has been derived in a way somewhat differing from those in previous lists, which in my experience is more reliable. If the star is given in the Draper Catalogue, the photometric magnitude is taken from that source in two cases, viz.

a. if given to two decimals (photometric measurement)
b. if in italics (derived from the C.P.D. magnitude reduced to Harvard scale and corrected for colour index).

Otherwise the photographic magnitude is taken and corrected for colour index. If the star is not contained in the H. D., the C. P. D. magnitude is reduced to Harvard photographic (*H. A.* **80**, 256) and corrected for the average colour index + 0·5 (F8 type), increased to + 1·0 if a red colour has been noted. The magnitudes therefore depend on the C. P. D. in all cases when no photometric determination is given; notwithstanding the uncertainty introduced by the colour correction I believe them to be, both individually and systematically, more reliable than those based on the Cordoba Durchmusterung.

B.	C.P.D.	1900 α	1900 δ	θ	ρ	mag.	spec.	Remarks
	°	h m s	° ′	°	″			
1406	43 5	0 3 16	−43 30	282	1·2	10·4 , 11·5	G	
1407	42 18	10 13	42 40	80	1·4	9·1 , 12·6	F5	
1408	....	10 32	50 50	62	2·3	10·0 , 10·3		50°28, 9·3 G0, is 6′ np.
1409	71 3	11 19	71 49	199	0·6	9·7 , 11·0	G0	
1410	43 40	20 44	43 2	236	2·2	10·5 , 10·8		
1411	47 61	30 54	46 54	278	1·8	9·3 , 12·6	G0	
1412	41 57	31 4	41 48	87	3·9	9·0 , 12·0		
1413	41 72	36 7	41 5	133	0·6	8·5 , 11·0	A0	
1414	50 125	47 12	50 42	12	0·5	9·4 , 9·4	F2	
1415	71 30	48 37	71 10	254	4·3	9·7 , 11·3	K0	
1416	50 132	50 8	50 0	346	0·8	9·4 , 12·4	A2	
1417	47 105	51 49	46 55	28	2·5	9·9 , 11·9		
1418	52 125	52 28	52 25	100	0·3	9·7 , 9·9	K2	
1419	40 86	52 45	40 29	268	0·6	9·8 . 10·0	G5	
1420	45 101	54 21	45 34	232	2·2	9·9 , 11·6	G	
1421	44 133	59 3	44 47	305	0·3	9·5 , 9·9	G0	
1422	50 157	1 5 57	50 11	235	1·7	11·5 , 13·3		
1423	44 165	14 49	44 9	153	3·2	8·8 , 13·5	G5	
1424	45 150	17 30	45 11	55	0·5	10·6 , 10·7	G0	
1425	52 174	18 59	52 11	239	1·5	9·7 , 12·7	G0	
1426	71 62	23 6	71 45	31	2·7	10·0 , 10·5	F2	
1427	44 210	36 1	44 22	343	5·2	10·1 , 13·5	F5	
1428	50 232	38 52	50 43	273	2·1	10·4 , 13·0	F8	
1429	50 287	55 25	50 38	25	0·8	8·4 , 11·9	G5	
1430	45 208	57 0	45 41	226	2·9	10·4 , 12·4	G5	
1431	50 299	2 1 21	50 33	24	7·3	7·8 , 11·7	A5	
1432	64 157	8 11	64 10	209	5·8	10·1 , 12·8	A3	
1433	41 210	16 15	41 51	160	5·4	8·8 , 13·0	A2	
1434	.....	18 39	58 30	51	2·0	11·0 , 11·5		58°205, 8·6 K0, is 3′ s.
1435	64 188	33 58	63 55	308	2·8	10·1 , 10·3		
1436	37 289	42 24	37 20	27	1·0	8·3 , 11·5	F5	
1437	64 201	48 5	64 26	283	0·2	9·2 , 9·5		
1438	64 204	50 4	64 26	340	0·6	9·0 , 9·2		
1439	[37 1088]	50 22	37 20	61	2·6	10·7 , 10·7		Cor DM number
1440	35 282	51 48	35 45	323	4·8	10·1 , 12·3		

B.	C.P.D.	1900 α			1900 δ		θ	ρ	mag.	spec.	Remarks
	°	h	m	s	°	′	°	″			
1441	50 402	2	54	34	−50	33	28	1·8	8·5 , 11·5	Fo	
1442	50 406		57	37	50	9	131	3·3	8·2 , 12·2	Ko	
1443	41 287	3	1	18	41	47	22	0·4	10·6 , 10·9		
1444	50 415		5	4	50	23	52	3·0	10·5 , 10·9		
1445	38 283		9	0	38	30	305	0·7	9·6 , 10·1		
1446	64 237		16	5	64	10	39	0·7	9·9 , 9·9	G5	
1447	45 330		16	31	45	36	253	0·7	11·7 , 11·7		Cor 18 is 3′ sf.
1448	38 298		18	57	38	49	251	3·3	8·6 , 11·9	Ko	
1449	36 351		22	7	36	18	215	0·2	7·9 , 8·1	A5	36°350, 6·2 A2, is 2′ np.
1450	38 302		22	22	38	43	190	2·0	10·0 , 10·9		
1451	36 353		23	19	36	17	40	1·4	8·7 , 11·7	Go	
1452	44 363		23	53	44	20	72	1·0	10·7 , 10·8		
1453	36 359		25	2	36	15	69	0·2	9·6 , 9·6	F5	
1454	41 360		33	30	41	14	336	1·6	8·1 , 11·4	Ko	
1455	44 379		33	53	44	48	44	0·7	8·5 , 12·2	F2	
1456	52 423		33	55	52	21	24	0·2	9·6 , 9·9	Go	
1457	35 371		38	28	35	2	68	0·3	10·5 , 10·8	Go	
1458	41 378		39	19	41	6	325	1·0	9·8 , 13·0	Go	
1459	41 386		41	50	41	45	351	0·3	10·2 , 10·4	Go	
1460	43 387		42	40	43	51	19	0·5	9·6 , 11·6	Go	
1461	42 374		50	43	42	10	136	0·3	9·3 , 9·6	Go	
1462	39 368		51	6	39	6	197	7·2	8·5 , 13·3	G5	
1463	41 425		58	30	41	8	60	1·3	11·2 , 14·2		41°426, 9·0 Fo, is 5′ sf.
1464	42 403	4	3	10	42	38	211	1·2	8·5 , 11,0	Go	
1465	41 443		5	1	41	45	27	1·7	9·0 , 14·3	Go	
1466	38 411		14	44	38	10	115	0·4	10·6 , 10·9	G	
1467	50 589		23	8	50	27	347	3·6	8·7 , 13·0	G5	
1468	64 328		23	19	64	25	347	0·3	9·8 , 10·1	Go	primary of *h* 3651
1469	52 557		39	18	52	30	292	0·4	8·9 , 9·4	Fo	
1470	52 560		40	13	52	21	94	0·4	9·3 , 9·9	Go	
1471	33 591		43	10	33	21	64	0·5	10·1 , 10·2	Go	
1472	36 586		45	6	36	12	218	0·2	9·8 , 10·1	F2	
1473	33 607		45	49	33	16	19	0·5	8·3 , 9·8	F8	
1474	31 623		46	24	31	23	343	0·3	9·7 , 9·7	G5	
1475	44 572		55	25	44	44	119	5·2	8·6 , 13·8	Fo	
1476	50 681		55	28	50	44	292	0·5	7·8 , 9·0	G5	
1477	52 631		59	13	52	12	66	4·0	9·5 , 12·5	A3	
1478	80 136	5	2	27	80	26	147	0·9	9·8 , 10·3		
1479	50 736		11	22	50	45	310	1·9	9·1 , 12·1	K2	
1480	39 645		18	9	39	22	63	0·3	10·4 , 10·4	A5	
1481	31 775		18	39	31	33	9	1·3	9·3 , 10·2	F8	
1482	39 675		24	38	38	59	277	1·2	7·5 , 11·8	G5	
1483	40 721		25	34	40	5	164	0·3	9·7 , 10·0	Go	
1484	45 640		31	0	45	45	231	2·9	9·3 , 12·6		
1485	33 848		31	23	33	39	100	1·3	8·0 , 11·5	Ko	
1486	40 757		32	55	40	46	140	0·3	10·3 , 10·4	A	
1487	31 859		33	40	31	10	235	1·0	9·5 , 12·7		31°861, 7·3 G5, is 3′ nf.
1488	29 989		42	32	29	3	236	0·5	10·2 , 10·7		
1489	36 798		43	58	36	31	209	3·2	7·1 , 12·5	K2	
1490	34 753		46	28	34	35	154	6·3	7·3 , 13·2	K5	
1491	29 1020		46	52	29	9	316	1·6	8·3 , 12·3	G5	
1492	33 933		47	55	33	17	358	1·5	10·1 , 12·1		
1493	52 791		48	19	52	48	270	0·3	6·8 , 7·6	F5+A	
1494	29 1034		48	31	29	20	192	1·2	9·9 , 12·9	Ao	
1495	32 950		49	34	32	50	23	0·2	8·6 , 8·8	A2	

B.	C.P.D.	1900 α	δ	θ	ρ	mag.	spec.	Remarks
1496	50°866	5h 49m 49s	−50° 56′	4°	2″·6	9·6 , 12·6		50°863, 8·5 G0, is 3′ np.
1497	41 847	52 39	41 44	119	2·2	9·8 , 10·2	G0	
1498	33 967	54 57	33 57	254	2·4	9·9 , 12·4	A0	
1499	31 981	57 51	31 24	285	10·3	9·9 , 11·4		AB
				270	3·2	11·4 , 12·9		BC
1500	40 894	58 24	40 16	332	4·7	8·9 , 13·3	G0	
1501	41 873	58 35	41 10	313	0·4	9·9 , 10·2	A0	primary of *h* 3827
1502	41 877	59 31	41 9	28	0·6	9·4 , 11·4	F2	
1503	29 1125	6 3 20	29 35	350	4·5	10·0 , 10·8		
1504	40 940	8 35	40 24	306	2·9	8·7 , 11·8	G5	Cor 34 is 3′ north prec.
1505	52 891	13 54	52 32	178	0·7	9·6 , 9·8	F8	
1506	40 986	17 0	40 59	95	0·5	9·3 , 9·7	A2	
1507	31 1119	20 17	31 53	254	3·8	8·9 , 13·5		
1508	50 964	21 22	50 10	111	0·4	9·2 , 10·0	F2	
1509	33 1146	21 23	33 43	339	3·7	8·5 , 13·0		
1510	50 967	22 6	50 2	156	2·2	8·7 , 12·2	F0	
1511	52 927	24 4	52 57	348	4·6	9·5 , 13·0	G5	
1512	50 976	24 39	50 33	252	0·5	10·5 , 10·6		
1513	52 951	31 56	52 14	271	3·2	10·8 , 10·9		
1514	50 1016	34 38	50 24	198	0·6	8·0 , 10·0	Ma	
1515	30 1378	35 31	30 57	25	0·8	9·9 , 10·9		
1516	33 1283	40 48	33 52	96	2·8	10·7 , 12·7		
1517	39 1061	41 0	39 52	334	1·0	9·2 , 12·2	A2	
1518	31 1318	41 37	31 10	2	3·3	8·9 , 10·9		
1519	30 1415	43 21	30 51	71	3·4	7·7 , 14·0	F5	
1520	28 1486	45 31	28 32	198	3·3	7·4 , 13·5	K0	
1521	28 1539	50 51	28 15	190	2·3	8·2 , 10·5	F5	
1522	29 1500	52 41	29 17	318	0·5	9·6 , 10·2	F5	primary of *h* 2356
1523	39 1186	53 50	39 42	22	42·0	9·5 , 12·7	A0	AB
				278	3·6	12·7 , 13·1		BC
1524	31 1367	53 54	31 4	17	0·6	10·0 , 11·9	A0	
1525	30 1483	54 40	30 22	344	1·6	9·8 , 12·0	A2	
1526	39 1213	56 56	39 20	213	0·7	9·7 , 10·3	F5	
1527	33 1341	59 24	33 4	3	1·6	9·3 , 11·5	A0	a faint 3″ pair is 1′ north
1528	52 1067	7 1 6	52 18	348	0·8	10·7 , 11·3		1066, 6·6 B8, is 2′ north prec.
1529	29 1569	4 42	29 21	14	3·0	9·3 , 14·7		
1530	33 1374	5 37	33 9	341	0·3	9·0 , 9·3	A5	
1531	29 1583	6 31	29 54	10	0·9	8·5 , 8·7	A5	
1532	29 1584	6 35	29 11	321	0·8	8·2 , 8·6	F5	
1533	30 1554	6 52	31 1	265	3·8	8·6 , 10·7	A2	
1534	29 1643	14 18	29 32	134	2·0	8·9 , 13·3	B9	
1535	31 1481	14 39	31 49	68	3·1	9·4 , 11·4	A0	
1536	33 1425	15 29	33 38	163	0·5	9·3 , 9·4	A0	
1537	29 1658	16 22	29 9	200	0·6	8·3 , 11·1	A0	
1538	30 1638	17 33	30 14	352	1·3	9·1 , 10·7		
1539	33 1451	19 16	33 52	51	4·4	8·5 , 10·7	K0	might be Ol 27 (not found)
1540	31 1536	20 52	31 35	206	1·0	7·8 , 10·8	A0	CD AB is δ 179, AC is Δ 47
1541	31 1538	21 13	32 2	271	1·8	8·8 , 10·1	A2	
1542	33 1474	22 1	33 42	157	0·5	9·3 , 10·0	G5	
1543	29 1715	23 2	29 37	154	2·0	8·4 , 10·9		
1544	30 1680	23 5	30 34	205	6·4	8·8 , 10·5	A0	AB CD is 2′ south foll.
				316	2·9	11·8 , 13·0		CD
1545	29 1725	23 54	29 55	271	1·0	10·0 , 11·3		
1546	30 1700	24 38	30 49	103	2·4	8·8 , 13·4	F5	
1547	49 1241	24 40	49 29	78	1·5	9·9 , 11·4	A0	

B.	C.P.D.	1900 α	δ	θ	ρ	mag.	spec.	Remarks
	°	h m s	° ′	°	″			
1548	33 1516	7 25 38	−33 24	135	1·3	9·3 , 10·3	F	
1549	43 1539	28 33	43 5	196	4·3	7·2 , 13·5	Ko	primary of Cor 50
1550	38 1393	29 3	38 45	300	2·7	9·3 , 10·1	A2	
1551	33 1583	30 49	33 23	16	0·2	9·6 , 9·8		
1552	38 1429	31 45	38 51	316	6·4	8·4 , 11·8	Ao	
1553	30 1842	33 31	30 35	19	5·2	8·7 , 13·0		1841, 7·7 B8, is 1′ north prec.
1554	31 1720	34 7	31 54	320	0·4	6·8 , 8·8	F5	
1555	29 1900	34 11	29 42	358	0·9	10·0 , 10·4	Ao	
1556	31 1746	35 26	31 4	37	4·2	8·7 , 12·0	B1	
1557	38 1481	35 47	38 12	281	3·8	11·6 , 11·7		1484, 8·5, is 1′ south foll.
1558	30 1932	38 15	30 41	322	0·6	9·0 , 9·5	B8	
1559	31 1842	40 0	31 14	71	0·4	9·4 , 9·4		
1560	31 1879	41 41	31 57	61	1·4	9·2 , 11·2	Ao	primary of Cor 55
1561	38 1597	42 15	38 44	8	3·8	8·9 , 10·0	A3	
1562	33 1775	43 34	33 21	303	5·7	8·8 , 10·3	red	AB
				208	2·7	10·3 , 10·6		BC
1563	28 2457	46 9	29 3	95	1·3	10·5 , 11·0		
1564	31 1960	47 5	31 57	124	2·1	9·4 , 10·0		
1565	31 1972	47 50	31 55	80	0·3	9·4 , 9·6		
1566	31 1973	48 3	31 23	98	1·3	8·5 , 9·3	B9	
1567	30 2089	48 57	30 51	212	2·7	9·4 , 9·6	K2	
1568	30 2104	51 6	30 50	241	3·5	8·5 , 11·0	G5	
1569	33 1871	52 57	33 5	347	1·1	9·2 , 11·2		
1570	43 1972	54 1	43 20	341	0·3	9·9 , 10·2	Ao	
1571	31 2038	55 47	31 58	206	2·9	9·5 , 10·1		
1572	30 2164	55 57	30 6	331	5·6	7·6 , 14·0	Go	
1573	31 2039	56 0	31 43	214	1·6	8·2 , 12·4	F5	
1574	31 2053	56 49	31 29	224	0·3	9·4 , 9·6	A2	
1575	31 2063	57 15	31 13	19	0·6	8·8 , 10·8	Ao	
1576	43 2075	57 51	43 59	348	1·6	9·4 , 11·9	A2	
1577	30 2218	59 53	30 41	153	3·8	9·2 , 12·2	F5	
1578	29 2281	8 0 40	29 39	126	2·0	10·1 , 13·1		2280, 7·6 Ma, is 2′ south prec.
1579	33 1942	1 13	34 2	293	0·5	8·1 , 8·2	F5	
1580	29 2308	2 25	29 36	220	2·6	10·3 , 10·6		
1581	29 2319	3 0	29 36	310	0·6	9·3 , 9·6	Go	
1582	31 2148	4 1	31 10	121	2·0	8·4 , 10·9	B9	
1583	29 2344	5 5	30 2	90	1·2	6·7 , 11·4	K5	
1584	49 1512	5 40	49 23	258	2·8	8·6 , 12·1	B9	
1585	30 2294	5 41	30 57	263	1·2	9·7 , 10·1	A2	
1586	52 1385	5 49	52 20	244	0·3	7·3 , 8·8	F2	
1587	29 2359	5 56	29 31	89	0·6	10·1 , 10·3		
1588	29 2360	6 0	29 29	250	3·6	11·1 , 11·7		
1589	31 2172	7 9	31 44	174	0·3	9·2 , 10·1	A2	
1590	29 2395	8 13	29 15	313	1·2	9·8 , 11·3		
1591	29 2408	8 59	29 14	57	4·0	9·5 , 11·4		
1592	31 2210	10 15	31 11	307	0·5	9·8 , 10·7	A2	
1593	29 2416	10 17	30 1	130	2·7	9·1 , 11·3		
1594	30 2337	10 50	30 41	165	1·5	10·1 , 10·5	Ao	
1595	31 2218	10 57	31 18	46	2·9	10·2 , 10·4	Ao	
1596	29 2449	12 34	29 13	16	0·3	10·3 , 10·9	B9	
1597	33 2090	15 24	33 38	208	1·7	9·1 , 12·1		
1598	66 818	16 18	67 2	309	4·5	8·9 , 11·4	Ko	
1599	30 2435	17 20	30 7	209	1·4	10·1 , 11·0	B9	
1600	29 2546	18 28	29 22	228	0·4	7·2 , 9·2	Fo	
1601	33 2148	18 43	33 31	44	0·3	9·5 , 9·5		

B.	C.P.D.	1900 α	δ	θ	ρ	mag.	spec.	Remarks
	°	h m s	° ′	°	″			
1602	29 2591	8 21 17	−29 40	192	0·4	9·5 , 10·2		
1603	30 2478	21 25	31 0	229	4·6	8·4 , 13·0	B9	
1604	29 2605	22 22	30 3	156	3·7	9·4 , 11·0	F2	
1605	38 2296	22 38	38 44	79	0·2	7·9 , 8·2	A0	companion of *h* 4093
1606	52 1480	24 11	52 22	85	0·2	7·2 , 7·5	F2	
1607	33 2217	24 17	33 37	359	0·4	9·7 , 9·8		
1608	29 2635	24 21	29 42	16	1·7	8·5 , 13·0		primary orange
1609	39 2495	27 24	39 53	249	0·4	9·4 , 10·5	B9	
1610	41 2649	28 15	41 42	29	1·9	8·7 , 11·0	B5	
1611	50 1645	28 30	50 15	30	1·1	9·7 , 11·3	F2	
1612	43 2684	28 53	43 35	146	1·7	7·6 , 14·2	B3	
1613	39 2531	28 56	39 25	297	1·0	9·0 , 11·5	A0	
1614	39 2533	29 2	39 47	69	1·2	9·9 , 10·0		
1615	38 2441	29 38	38 23	267	1·3	9·4 , 12·4	A2	
1616	43 2740	31 30	43 20	356	0·3	9·4 , 9·7	F2	
1617	43 2758	32 21	43 25	119	0·2	8·3 , 8·7	A5	
1618	38 2507	33 48	38 45	284	0·2	9·6 , 9·8		
1619	39 2690	34 20	39 13	124	4·1	9·0 , 11·2		
1620	39 2693	34 27	39 12	277	0·4	9·7 , 10·2		2694, 8·7 K, is 1′ north
1621	33 2329	34 50	33 31	5	0·7	8·2 , 8·5	G5	
1622	50 1692	35 22	50 47	48	2·6	9·0 , 11·5	A0	AB
				19	11·1	10·0		AC
1623	39 2725	35 30	40 4	251	0·6	7·6 , 8·4	Oe5	
1624	52 1599	39 13	52 24	118	0·2	8·2 , 8·6	G5	
1625	52 1605	39 27	52 45	112	0·5	5·9 , 7·6	B9	
1626	38 2622	39 51	38 45	25	1·0	9·2 , 10·1	A3	
1627	39 2804	39 54	39 54	120	0·3	9·6 , 10·3		
1628	38 2632	40 15	38 25	272	5·1	6·9 , 13·8	K0	
1629	30 2669	42 54	30 37	23	0·3	9·9 , 10·1	F5	
1630	39 2880	43 51	39 52	126	4·0	7·6 , 12·2	K5	
1631	38 2719	44 49	38 39	167	3·3	8·2 , 9·3	A0	
1632	43 3044	47 20	43 23	65	2·0	7·3 , 10·8		primary orange
1633	30 2708	47 36	30 46	219	0·3	8·6 , 9·1	A0	
1634	43 3109	50 1	44 0	146	0·7	9·1 , 9·8		
1635	50 1866	50 17	50 45	259	2·7	9·1 , 14·3	B8	
1636	39 3000	50 52	39 6	231	0·5	7·1 , 9·9	K0	
1637	50 1917	53 22	50 8	94	0·3	9·9 , 10·2	F8	
1638	39 3100	56 23	39 10	25	4·1	9·5 , 13·8		
1639	38 2907	58 7	38 26	2	3·1	7·9 , 14·0	G0	
1640	49 2114	58 47	50 1	170	0·5	10·2 , 10·9		2118, B 174, is 3′ south foll.
				273	6·9	11·5		AC
1641	39 3155	59 45	39 43	180	1·6	9·9 , 10·0	F0	
1642	31 2651	9 0 1	31 47	121	2·2	9·3 , 12·6	F5	
1643	38 2972	2 13	38 29	185	1·6	9·1 , 9·4	A2	
1644	31 2666	3 41	31 38	44	3·3	7·8 , 14·5	K5	
1645	39 3218	3 42	39 26	122	3·6	7·6 , 10·3	A2	
1646	43 3354	3 44	43 33	24	0·3	9·5 , 9·9	A3	primary of *h* 4180
1647	39 3263	6 53	39 9	166	3·6	8·3 , 10·6	F8	
1648	50 2158	10 49	50 46	236	1·8	9·2 , 11·6	K0	
1649	39 3348	11 9	39 51	14	1·8	8·3 , 12·9	A0	
1650	31 2705	14 14	31 31	173	1·3	10·0 , 10·1	A0	
1651	45 3677	17 30	45 35	128	0·6	8·2 , 9·7	F2	primary of *h* 4202
1652	52 2396	25 46	52 37	71	1·2	9·1 , 10·9	A3	
1653	52 2467	28 16	52 41	147	0·4	9·4 , 9·8		
1654	52 2646	34 52	52 57	194	0·7	9·4 , 10·5		

B.	C.P.D.	1900 α	1900 δ	θ	ρ	mag.	spec.	Remarks
	°	h m s	° ′	°	″			
1655	45 3900	9 35 36	−45 19	145	1·4	9·5 , 10·1	F0	
1656	31 2577	36 15	51 2	255	1·6	9·1 , 13·3	A2	
1657	52 2738	39 53	52 11	104	2·1	9·4 , 11·6		
1658	50 2636	39 54	50 46	199	2·2	6·5 , 11·5	B8	
1659	50 2681	41 44	51 4	37	1·7	9·1 , 12·1		
1660	52 2793	43 7	52 30	343	3·9	9·4 , 11·9	B	
1661	45 4040	44 23	46 4	12	0·2	9·1 , 9·3	A2	
1662	50 2756	45 4	50 32	130	0·5	9·4 , 9·4	F0	
1663	52 2830	45 17	52 9	278	1·2	7·6 , 11·6	K0	
1664	52 2878	47 27	52 49	276	1·7	9·1 , 10·9	A2	
1665	52 2885	47 44	52 43	279	0·2	9·6 , 9·9	B5	primary of the group Cor 93
1666 [1]	29 3152	53 20	29 59	38	2·5	10·0 , 13·5	F8	
1667	52 3010	55 13	52 40	211	1·5	9·3 , 12·9	A0	
1668	52 3081	57 54	52 59	17	2·5	8·7 , 13·5	G5	
1669	30 3033	58 29	30 56	201	1·4	8·9 , 12·4	K0	
1670	52 3143	59 49	52 34	211	0·8	8·3 , 11·3	F5	
1671	52 3226	10 3 12	52 16	295	3·5	9·5 , 11·5		
1672	39 4297	11 34	39 56	26	0·3	9·4 , 9·4	G0	
1673	60 1817	13 43	60 50	164	16·6	3·4 , 12·0	K5	AB q Car
				nf	20	12·5		AC
1674	60 1836	15 25	60 27	98	3·1	8·6 , 13·5	K5	
1675	60 1890	20 57	61 3	1	1·6	7·5 , 9·0	A0	
1676	52 3571	22 17	52 31	5	1·9	9·8 , 11·8		
1677	50 3459	23 11	50 9	252	2·0	9·6 , 12·8	A0	
1678	60 1909	23 24	60 9	234	0·3	9·6 , 10·6		AB also a faint triple 20″
				197	4·2	9·1 , 12·5		AB, C [north
1679	33 2902	24 26	33 44	163	3·1	10·2 , 10·4		
1680	52 3601	24 43	52 8	139	3·4	9·5 , 12·1	K0	
1681	49 3499	25 19	50 4	320	1·1	9·9 , 10·9	F5	
1682	49 3556	29 12	49 24	215	0·5	9·6 , 10·7	A3	
1683	52 3702	30 48	52 39	275	0·5	10·1 , 10·1		
1684	64 1345	30 53	64 43	297	1·5	8·5 , 12·0		
1685	52 3706	30 56	52 16	23	2·6	10·0 , 12·0	A	
1686	49 3578	31 17	49 14	158	1·6	9·4 , 13·0	A2	AB
				134	7	12·0		AC
1687	64 1353	31 30	64 23	40	0·8	8·8 , 10·8	G0	
1688	49 3627	34 50	50 0	326	1·9	9·5 , 11·2		
1689	52 3807	36 47	52 45	234	1·6	9·5 , 9·8	A0	
1690	33 2948	37 37	33 11	294	5·7	9·3 , 12·1		2946, 8·9 K2, is 1′ south prec.
1691	60 2176	38 12	60 33	113	2·2	8·9 , 11·9	B9	
1692	52 3874	40 38	52 39	152	1·2	10·5 , 10·6	A0	
1693	71 1123	43 24	71 39	338	5·1	7·7 , 13·0	K2	
1694	30 3251	53 50	30 30	129	0·6	9·9 , 9·9	F0	
1695	49 3893	56 5	49 50	249	0·2	9·1 , 9·6	F5	
1696	19 4760	56 46	19 23	7	2·0	9·2 , 12·7	F8	
1697	21 4952	11 21 15	22 8	133	3·1	8·8 , 14·2	A0	
1698	21 4956	22 6	21 40	15	3·2	8·5 , 14·8	K0	
1699	71 1253	24 12	71 55	4	0·2	6·9 , 7·2	B3	
1700	60 3034	27 52	61 4	252	0·6	9·0 , 10·0	B8	
1701	19 4900	30 10	20 0	218	0·6	9·0 , 9·3	F5	
1702	30 3367	34 14	30 29	98	0·7	10·1 , 10·2	F2	
1703	70 1404	34 26	70 20	329	0·5	8·4 , 8·6	A0	1407, north foll. in field, is a
1704	62 2188	34 30	62 46	333	2·4	8·8 , 13·5		[4″ pair

[1]) Found while measuring B 1138, −29°3152, which is 4′ north following; 3151, 9·8 K0, is 2′ np.

B.	C.P.D.	1900 α	1900 δ	θ	ρ	mag.	spec.	Remarks
	°	h m s	° ′	°	″			
1705	64 1685	11 34 51	−64 51	117	0·2	5·5 , 6·3	G0+A0	AB C and D are I 34
1706	64 1687	35 23	64 43	88	1·0	9·1 , 11·9	A0	
1707	70 1434	46 4	70 32	62	1·1	9·4 , 11·2		
1708	19 4968	47 15	19 25	194	0·4	9·2 , 9·4	G5	
1709	19 4974	48 45	19 57	208	0·8	8·9 , 11·2	F0	AB
				295	4·6	12·9		AC
1710	64 1734	49 44	64 40	271	3·1	9·2 , 13·1	B9	
1711	30 3400	52 23	30 57	173	2·8	10·0 , 13·8	G5	
1712	71 1297	53 1	71 13	233	3·2	8·2 , 12·5	F2	a faint 5″ pair 1′ south prec.
1713	19 5026	59 25	20 4	62	1·7	9·4 , 10·4	F0	

The following pairs published in earlier lists are contained in the Cape Astrographic Catalogue and have been assigned to the Cape:

		h m
B 1162	at	10 27·8
B 1186		11 14·3
B 874		16 22·8
B 1327		49·4

Furthermore B 1172, C.P.D. −45°4947 at $10^h45^m·3$, −45°13′ is a misidentification for Cp 198—9, C.P.D −45°4945 at $10^h45^m·0$, −45°11′.

The following pairs were suspected of duplicity on the Cape plates:

		h m
B 1223	at	13 02·9
B 867		16 13·3
B 884		52·0

Mr. H. D. DONNER of the Lamont-Hussey Observatory, Bloemfontein, has drawn my attention to the fact that a large percentage of these stars, suspected of duplicity on Astrographic plates, are not double, the suspicion being due to plate defects. A good example of this is C.P.D. −31°2627, given in the *S.D.S.* as Pr 78 at $8^h54^m·9$. The Perth description is

1909·2 94°·1 3″·60 Δm 1·1,

whereas I have in 1928 and 1929:

1928·6 180°·0 1″·15 Δm 0·1.

Obviously the pair is too close for an Astrographic plate, the Perth discovery accidental and due to a plate defect, the actual discovery by me in 1928. It seems better to accept only those pairs from the Astrographic Catalogues, where the two components could be separately measured.

The following pairs were noted during the searches, but are either too wide or too faint for numbering and measurement at present. I hope to measure the closer ones later on; for the time being the more interesting pairs must take precedence. A B-number will be assigned to them in case they will be measured later. The list gives the C.P.D. number, the C.P.D. magnitude, the Harvard visual magnitude and spectral type, the position for 1900 and such descriptions as I noted in my observing book, the column Δm giving the estimated difference if under 6, otherwise the estimated magnitude(s).

C.P.D.	mag.	Harv.	1900 α	1900 δ	p	d	Δm	Remarks
°			h m	° ′	°	″		
64 353	9·0	9·8 F0	4 34·0	−64 52		7		
50 832	10·2	11·1	5 41·5	50 2		5		
50 845	10·1	11·0	44·3	50 45		2		
43 736	9·2	11·0 A0	57·1	43 52	330	1	3	
43 790	10·0	10·5	6 13·5	43 36	80	0·4	0·5	
			41·6	64 25	258	2	11·5, 11·7	north prec. I 284
31 1438	8·4	7·40 Ma	7 8·6	31 49	217	7	12·5	
33 1491	9·2	9·2	23·6	33 32	250	1	1·0	
30 1967	9·2	9·2	40·4	31 2	310	6	1·5	
31 1857	9·3	9·4	40·8	31 49	190	1	2·5	

C.P.D.	mag.	Harv.	1900 α	δ	*p*	*d*	Δ*m*	Remarks
° 31 1903	8·6	8·8 Ao	h m 7 43·0	° ′ −31 57	° 40	″ 7	12·5	
			45·4	28 47	165	4·5	11·2 , 13·0	prec. B 1080
			46·5	31 55	185	1·2	11·7 , 12·0	south of *h* 4009
31 2002	9·8	10·2	51·4	31 36		4		
33 1872	9·4	9·6	53·0	33 36	290	1·5	0·7	
30 2170	8·4	8·1	56·4	30 40	170	5·5	14	
31 2104	9·4	9·6	59·9	31 16		4		
31 2154	8·8	9·2 A	8 5·1	31 14	300	6	12·5	
31 2177	9·4	9·1 B	7·8	31 51	150	3	0·5	
31 2178	9·2	9·0	8·0	31 36	340	2	1·0	
33 2021	7·9	6·41 K2	9·8	33 16	280	6	12	
30 2342	9·6	9·9	11·2	30 34	185	2	1·0	
33 2039	8·7	8·0 Ko	11·9	33 46	250	6	13·0	
49 1599	9·8	10·2	17·0	49 23		3		
33 2141	8·8	9·1 A2	18·4	33 49	240	7	0·5	
30 2457	8·3	6·98 K2	19·5	30 29	280	8	14	
30 2459	9·2	9·3	19·6	30 7	310	6	2·0	
33 2174	9·2	9·0 Ao	20·5	33 10		7		
52 1466	9·9	10·3	22·5	52 37		2		
38 2420	9·2	9·2	28·7	38 49	270	1	1·0	
52 1521	9·9	10·3	29·9	52 13		0·5		
43 2788	7·4	6·2 G5	33·6	43 28	*sf*	6	11	suspected in Cape [Agr.
38 2515	9·2	9·2	34·3	38 19	196	2·5	0·3	
50 1690	9·7	10·0	35·3	50 7		4		
30 2671	8·5	8·60 Ko	43·1	30 6	0	8	2·5	
38 2688	9·6	9·8	43·2	38 24	320	1	1·0	
38 2692	9·2	9·2	43·6	38 20	0	0·8	3·0	
30 2676	8·6	8·4 Go	43·9	30 52	320	8	14·0	
43 3082	8·6	8·7 Ao	48·8	43 47	*p*	6	13	also faint 2″ pair south [foll.
33 2432	9·8	10·3	49·7	33 21	260	2·5	0·5	
38 2893	9·7	9·6	57·1	38 30	280	3	2·0	
43 3251	9·4	8·9 K	57·8	43 19		7	13	
52 1987	9·6	10·0	9 6·2	52 34	280	2	1·0	
45 3650	9·2	9·3 F	16·1	45 22		6		
45 3692	10·0	10·4	18·3	45 12		1·5		3693, 9·78 A2, is 2′ [south foll.
52 2315	9·4	9·6	21·3	52 41	170	4	0·3	
52 2397	9·6	9·9	25·8	52 7	300	4	2·5	
52 2414	9·9	10·3	26·7	52 17	*sp*	3	0·5	
52 2429	9·6	9·9	27·1	52 28		4		
52 2437	9·2	9·3	27·3	52 28	340	2	3·5	
52 2489	8·3	9·3 Ao	29·3	52 56	*n*	7	15	
52 2522	9·2	9·3	30·4	52 56		1		
45 4000	9·4	9·7	41·5	45 39	240	4	1·5	
52 3039	9·0	9·5 B9	56·5	52 31		6		
52 3099	9·5	9·8	58·4	52 54		1		
60 1842	8·0	8·0 B8	10 15·9	60 36	*n*	10		A, BC
					340	2	12·0 , 12·5	BC
49 3407	8·2	8·2 F5	19·4	49 51		6		
52 3567	9·7	10·3	22·1	52 34		3		
52 3595	9·4	9·9	24·5	52 14		3		
51 3327	9·6	10·2	24·6	52 6		1		
52 3609	9·2	9·6	25·5	53 0		2		
52 3611	8·6	8·1 K2	25·5	52 15		7		
19 4648	8·5	8·0 Ko	27·2	19 50	67	7	1·0	
52 3733	9·8	9·5 A2	33·1	52 35	150	2	1·5	