30*c*. SUB-COMMISSION ON THE OBSERVATION OF SPECTROSCOPIC BINARIES

This sub-commission was not reorganized immediately after the death of its former President, the late Dr J. H. Moore, and no report appeared in Vol. **8** of the *Transactions* (1954). However, the opinions of the remaining members of the sub-commission were favourable to its continuation, and accordingly it has now been reorganized. In so far as eclipsing binaries are also spectroscopic binaries, there will undoubtedly be a little overlapping of the functions of Sub-commission 30*c* and Commission 42. It is not anticipated that there will be extensive duplication of effort in connexion with this overlapping.

At several observatories the emphasis in spectrographic observation has gradually shifted away from pure radial velocity work and spectroscopic binary orbits to problems of a more definitely astrophysical nature. Even in the lists of stars of variable velocity that are now being followed, there are many for which the main purpose of observation is the study of phenomena other than, or in addition to, orbital motion. In the list that will be distributed directly to all members of Commission 30 and to all interested observatories, fully half of the objects fall in this latter category.

In spite of the shift of interest away from pure orbital motion, and doubtless in part because of the numerous special phenomena exhibited by binary systems, the number of stars of variable radial velocity now under observation is greater than ever. To a large extent this increase is due to the great growth of radial velocity work in the southern hemisphere. For the first time the list of binaries contains numerous objects that are being followed at Pretoria (both by Radcliffe and Cape astronomers), Cordoba and Canberra. The total number of entries in the list from these observatories is 110.

Besides the list mentioned above, Dr Struve indicates that he is observing several stars of the β Canis Majoris type, but the list of individual stars was not specifically given.

A list of fifty spectroscopic binaries and seventeen additional probable binaries discovered at Simeis has been received from Dr G. A. Shajn. The observation of these stars has not been resumed since its discontinuance during the war.

D. B. McLAUGHLIN
President of the Sub-commission

Supplement to Draft Report

REPORT OF SUB-COMMISSION 30*a* ON STANDARD VELOCITY STARS

The *General Catalogue of Stellar Radial Velocities*, compiled by Dr R. E. Wilson in 1953, lists a total of 2582 observations of the twenty-five bright standard velocity stars. Approximately one-fifth of the observations were secured with low-dispersion spectrographs, and the inclusion of such velocities of low weight weakens rather than strengthens the adopted velocities for the stars concerned. A thorough revision of the radial velocities has been undertaken, adopting the limiting dispersions of 22 Å/mm. at Hγ for the bright standard stars of Table I, and 38 Å/mm. at Hγ for the fainter stars of Table II.

Table I contains 2106 high-dispersion observations of the twenty-five stars, secured at fourteen different observatories, reduced to the Lick Observatory system by the application of the systematic corrections adopted by J. H. Moore (*Lick Publications*, vol. **18**, 1932), and following his precepts regarding the relative weighting for the varying number of observations and the different dispersions employed. No systematic corrections were applied to the Lick or Victoria velocities. The recent high-dispersion observations at Victoria have been based upon the revised wave-length standards of R. M. Petrie (*Contr. Dom. Ap. O.* no. 4, 1946, no. 10, 1947, and no 11, 1948).

Table II contains 607 observations obtained at seven different observatories. Approximately one-half were secured with high-dispersion spectrographs, and for these observations the systematic corrections of Moore are applicable. For the single-prism observations of dispersion 30 to 38 Å/mm. at Hγ, the systematic corrections deduced by R. E. Wilson (*Trans. I.A.U.* **8**, 486, 1952) were applied. The recent two-prism observations of 22 equatorial and southern stars observed at the Radcliffe Observatory materially strengthen the velocities of the fainter standard stars. The Cape-Radcliffe velocities were based upon the Victoria revised wave-length standards, and all plates were measured by both D. S. Evans and A. Menzies.

As the primary purpose of the standard velocity stars is to provide suitable objects for checking the performance of the spectrographs employed, and not to study wave-length problems, it seems advisable to retain only F- to M-type stars and to drop the two A-type stars, η Leonis and α Lyrae, from Table I. No useful purpose is served in retaining the B-type stars suggested as standard velocity objects in *Trans. I.A.U.* **4**, 181, 1932. The star HD 119771, suspected of variable radial velocity by Evans, is omitted from Table II, as it may well be a long-period spectroscopic binary. Four additional late-type stars with accordant velocities have been added.

The continued observation of the stars listed in Table II, preferably with higher dispersion, is recommended.

JOSEPH A. PEARCE
President of the Sub-commsision

TABLE I

Standard Velocity Stars Brighter than Magnitude 4·3

HD	Name	Mag.	Type	α (1950) hr. min.	δ (1950) ° ′	V (km./sec.)	Number of observations
3712	α Cas	2·47	gG7	00 37·7	+56 16	− 3·9±0·1	33– 4
4128	β Cet	2·24	gG6	00 41·1	−18 16	+13·1±0·1	76– 4
12929	α Ari	2·23	gK1	02 04·3	+23 14	−14·3±0·2	115–10
18884	α Cet	2·82	gM2	02 59·7	+03 54	−25·8±0·1	27– 3
20902	α Per	1·90	cF4	03 20·7	+49 41	− 2·3±0·2	253–12
29139	α Tau	1·06	gK5	04 33·0	+16 25	+54·1±0·1	171– 8
36079	β Lep	2·96	gG1	05 26·1	−20 48	−13·5±0·1	42– 4
36673	α Lep	2·69	cF3	05 30·5	−17 51	+24·7±0·2	19– 2
45348	α Car	−0·86	cF0	06 22·8	−52 40	+20·5±0·1	114– 2
62509	β Gem	1·21	gG8	07 42·3	+28 09	+ 3·3±0·1	167–10
81797	α Hya	2·16	gK5	09 25·1	−08 26	− 4·4±0·2	68– 3
84441	ϵ Leo	3·12	cG3	09 43·0	+24 00	+ 4·8±0·1	58– 7
102870	β Vir	3·80	dF8	11 48·1	+02 03	+ 5·0±0·2	22– 4
108903	γ Cru	1·61	M4	12 28·4	−56 50	+21·3±0·1	28– 2
109379	β Crv	2·84	gG4	12 31·8	−23 07	− 7·0±0·0	50– 2
124897	α Boo	0·24	gK0	14 13·4	+19 27	− 5·3±0·1	528–12
146051	δ Oph	3·03	gM0	16 11·7	−03 34	−19·8±0·0	26– 3
150798	α TriA	1·88	K5	16 43·4	−68 56	− 3·7±0·2	27– 2
156014	α Her	3·48	gM5	17 12·4	+14 27	−32·5±0·0	19– 3
161096	β Oph	2·94	gK1	17 41·0	+04 35	−12·0±0·1	32– 7
168454	δ Sgr	2·84	gK2	18 17·8	−29 51	−20·0±0·0	43– 2
186791	γ Aql	2·80	gK4	19 43·9	+10 29	− 2·1±0·2	60– 9
204867	β Aqr	3·07	cG0	21 28·9	−05 48	+ 6·7±0·1	44– 3
206778	ϵ Peg	2·54	cK0	21 41·7	+09 39	+ 5·2±0·2	63–10
222368	ι Psc	4·28	dF5	23 37·4	+05 21	+ 5·3±0·2	21– 3

TABLE 2

Standard Velocity Stars Fainter than Magnitude 4·3

HD	Mag.	Type	α (1950) hr. min.	δ (1950) ° ′	V (km./sec.)	Number of observations
693	5·0	dF5	00 08·7	−15 45	+14·7±0·2	19–4
3765	7·5	dK5	00 38·1	+39 55	−63·0±0·2	9–2
8779	6·5	gK0	01 23·9	−00 39	− 5·0±0·6	13–3
9138	5·1	gK4	01 27·6	+05·53	+35·4±0·5	20–4
22484	4·4	dF9	03 34·3	+00 15	+27·9±0·1	25–5
26162	5·7	gK1	04 06·2	+19 29	+23·9±0·6	16–5
29587	7·3	dG2	04 38·1	+42 02	+112·4±0·2	9–2
35410	5·2	gK0	05 21·9	−00 56	+20·5±0·2	21–4
44131	5·2	gM1	06 17·5	−02 55	+47·4±0·3	17–4
51250	5·2	M0	06 53·8	−13 59	+19·6±0·5	19–3
65583	6·9	dG7	07 57·4	+29 22	+12·5±0·4	7–1
66141	4·5	gK3	07 59·7	+02 28	+70·9±0·3	20–5
80170	5·4	K5	09 15·0	−39 11	0·0±0·2	12–3
89449	5·0	dF5	10 17·0	+19 44	+ 6·5±0·5	19–5
92588	6·4	sgK1	10 38·9	−01 29	+42·8±0·1	16–2
103095	6·5	dG5	11 50·1	+38 05	−99·1±0·3	18–4
107328	5·1	gK1	12 17·8	+03 35	+35·7±0·3	20–4
114762	7·7	dF7	13 09·9	+17 47	+49·9±0·5	7–1
115521	5·0	gM2	13 15·1	+05 44	−26·8±0·3	18–4
123782	5·4	gM2	14 06·4	+49 42	−13·4±0·3	17–4
126053	6·3	dG3	14 20·7	+01 28	−18·5±0·4	14–3
136202	5·2	dF6	15 16·8	+01 57	+53·5±0·2	24–5
144579	6·8	dG8	16 03·2	+39 17	−60·0±0·3	15–3
145001	5·3	gG4	16 05·8	+17 11	− 9·5±0·2	29–3
154417	5·9	dF8	17 02·7	+00 46	−17·4±0·3	18–3
157457	5·2	K1	17 22·1	−50 35	+17·4±0·2	12–3
171391	5·2	gG7	18 32·3	−11 01	+ 6·9±0·2	16–3
182572	5·2	dG7	19 22·6	+11 50	−100·5±0·4	15–4
184467	6·7	dK5	19 30·3	+58 29	+10·9±0·2	13–2
187691	5·2	dF8	19 48·6	+10 17	+ 0·1±0·3	38–5
203638	5·5	gK2	21 21·3	−21 04	+21·9±0·1	17–4
212943	4·9	sgK0	22 25·3	+04 27	+54·3±0·3	34–5
213014	7·7	gG8	22 25·8	+17 00	−39·7±0·0	13–2
223311	6·3	gK4	23 46·0	−06 39	−20·4±0·1	18–2
223647	5·1	G7	23 49·2	−82 18	+13·8±0·4	9–2

Report of Meeting. 3 September 1955

PRESIDENT: Dr A. D. Thackeray.

SECRETARY: Dr J. F. Heard.

1. *Sub-commission on Wave-Lengths*

The report of the sub-commission was reviewed and adopted. Dr Thackeray stated that Dr Petrie wished to resign as President, and he asked the meeting to consider the question of recommending dissolution of the sub-committee in view of the fact that its work had been essentially completed with the establishment of the wave-lengths for B- to K-type stars by Dr Petrie and his Victoria colleagues. There was some discussion concerning the remaining problems of the O-type stars (still being studied at the Dominion

Astrophysical Observatory, Victoria) and of the late-type stars, but it was agreed that these problems did not require the continued existence of a special sub-commission.

It was resolved to recommend to the Executive Committee that the Sub-commission on Wave-Lengths be dissolved. Warm appreciation of the fundamental work of Dr Petrie and his colleagues was expressed.

2. *Sub-commission on Spectroscopic Binaries*

The report of the sub-commission was reviewed and adopted. Attention was drawn to Dr McLaughlin's recently distributed supplementary list of stars under observation at different observatories for various purposes. Although there was danger of overlap with Commission 42, it was agreed that the distinction between spectroscopic and photometric observations should be maintained and that the sub-commission should be continued.

3. *Sub-commission on Standard Velocity Stars*

Dr Pearce's report, received at the beginning of the Assembly, was circulated and reviewed. Discussion centred on two points, namely, the possible requirements for standard velocity stars of early spectral types, and the question of the sufficiency of the present lists.

With regard to the first point, Dr Fehrenbach stressed the need in objective-prism work for stars of known and constant velocity in all spectral classes. It was recommended that the establishment of such a list, not necessarily for instrument performance tests but rather to serve for comparator standards, be on the agenda of the sub-commission for the next three years.

Dr Thackeray then referred to the question of the adequacy of the present lists, especially in the southern sky, the Canberra workers in particular having requested a large increase in the number of the standards between $-30°$ and $-90°$. In Dr Pearce's lists the distributions are as follows for stars north of $+20°$, between $+20°$ and $-20°$, and south of $-20°$ respectively: for the bright stars 5, 14 and 6, for the fainter stars 7, 23 and 5. Some members believed that the lists were adequate but others felt that they were not, especially as to stars nearer the poles which may be reached over large ranges of hour angle at high latitudes. Dr Thackeray believed that there was general willingness to increase the number of standard velocity stars moderately and recommended this problem to the sub-commission.

It was agreed to submit Dr Pearce's report as a supplementary report.

4. Dr Thackeray then referred to the Report of the Commission on Radial Velocities. He drew attention to the work of Dr Abt of the McDonald Observatory which had arrived too late for inclusion. Dr Abt has made radial velocity observations of stars of various classes of variables much as T Tauri, cepheids, etc.

The report was adopted.

5. Dr Fehrenbach reported further on the progress of the slitless technique at the Observatoire de Haute Provence, explaining the instrumental improvements both in the method of obtaining spectrograms and of measuring them. The results which he quoted compared favourably with results obtained with slit spectrograms. The present 15-cm. objective reaches stars to 10th magnitude; a 40-cm. objective which is to be brought into use in 1956 will reach to 12th or 13th magnitude. Dr Fehrenbach referred again to his need for stars of known velocities of all spectral types to serve as comparator standards.

Dr Melnikov reported briefly on experiments in the slitless technique made at Pulkovo Observatory with the use of a 10-cm. Ross lens. Dr Schalén reported on preliminary results at Uppsala, where a 15-cm. astrograph is used and the methods are similar to those of Dr Fehrenbach.

Dr Thackeray congratulated and encouraged those who were developing the slitless technique and offered them the help of the Commission.

6. Dr Thackeray then referred to the question of choice of programmes for future radial velocity work, mentioning the Report of Commission 33 and the Report of the Groningen Symposium on co-ordination of galactic research. He called upon Dr Blaauw for recommendations.

Dr Blaauw summarized the desiderata as follows:

(*a*) Confirmation of 21-cm. velocity observations is needed, since these are based on the structure of the arms assumed from certain motions. What are needed are more radial velocities of O and B supergiants down to 12th magnitude. Lists of these have been published by Morgan and Nassau and the Tonantzintla observers. The best radial velocity data will be obtained by choosing about ten stars belonging to the same association so that the accidental errors of distance and the errors due to random velocities may be eliminated.

(*b*) Radial velocities of cepheids are still needed, but not so urgently now since the recent work by Mount Wilson and Radcliffe Observatories.

(*c*) Velocities are needed for the M supergiants which are almost as closely associated with the spiral arms as are the OB stars.

(*d*) More accurate velocity measurements are needed for stars brighter than 6th magnitude in order to match the very accurate proper motions which will become available within the next ten years. For many spectroscopic binaries in this class accurate radial velocities are not known.

(*e*) Velocity data are needed for stars between 6th and 9th magnitudes. In designing programmes it is important to choose those stars for which other data are already available, for example proper motions and accurate photometry.

7. Prompted by the foregoing recommendations, members of the Commission offered the following information:

Dr Gratton and his colleagues have observations for stars in the η Car association to the 10th magnitude, for the group near κ Cru to magnitude 9·5 and for the southern cepheids to 9th magnitude.

Dr Stibbs' work on fifty-five southern cepheids is in the Press.

The Canberra observers have undertaken the radial velocity determination of those stars in the N30 catalogue whose velocities are unknown or still uncertain. They would welcome help in this project for the stars north of $+20°$.

Harvard observers have completed the photometry of a selection of stars in the south galactic polar cap. Radial velocities of fifty-nine selected stars are urgently needed. Dr Bok invites correspondence on this point.

Addendum

At the joint meeting of Commissions 27 and 29, held in Dublin, attention was called to the need for radial velocity observations of:

1. Stars with composite spectra.
2. Visual binaries with moderately long periods (15 to 40 years).

These desiderata are being circulated to members of Commission 30.