

### 30. COMMISSION DES VITESSES RADIALES STELLAIRES

PRÉSIDENT: Professeur Ch. Fehrenbach, Directeur de l'Observatoire de Marseille, 2 Place Le Verrier, Marseille 4ème, France.

VICE-PRÉSIDENT: Dr R. M. Petrie, Dominion Astrophysical Observatory, Royal Oak, Victoria, B.C., Canada.

COMITÉ D'ORGANISATION: F. K. Edmondson, J. F. Heard, A. D. Thackeray.

SECRÉTAIRE: Dr D. S. Evans, Royal Observatory, Observatory, C.P., South Africa.

MEMBRES: Abt. Boulon, Buscombe, Gollnow, Gratton, Herbig, Northcott, Pagel, Pearce, Sahade, Underhill, Wayman.

Suivant une vieille coutume de cette Commission, nous publions d'abord les rapports des divers Observatoires engagés dans des mesures de vitesses radiales.

#### RAPPORTS DES OBSERVATOIRES

##### *Royal Observatory, Cape*

In 1962 the Cape radial velocity programme was extended by the addition of 533 stars selected with emphasis on nearby stars and sub-dwarfs, using Gliese's catalogue of nearby stars, parallax material, Luyten's two-tenths catalogue and a list of stars chosen as possible sub-dwarfs. These stars range in declination up to the equator, down to a parallax limit of about  $0''.030$  and down to a magnitude limit of 12. They were supplemented later by a further 91 stars comprising further sub-dwarfs, newly discovered nearby stars and a list of visual binaries proposed by M. Dixon. Effectively the Cape lists now include all known nearby stars in the southern sky down to about 12th magnitude. The list also includes many known and suspected sub-dwarfs.

The much fainter magnitude limit now made accessible has been rendered possible by the installation at the Radcliffe Cassegrain spectrograph of a new  $f/1$  camera giving a dispersion of  $171\text{Å}/\text{mm}$  at  $H\gamma$ . Much of the time with this camera has been occupied by G. A. Harding on a programme of velocity measures of individual stars in  $\omega$  Centauri for the Astronomer Royal. The remainder has been devoted to Cape programmes and the observation of standard stars and indicates that results of tolerable precision can be expected even for very faint stars. Some of the time with the new camera is being devoted to observations of a list of RR Lyrae stars in the South Galactic Cap selected by the Astronomer Royal. Concurrent observations of magnitudes, colours and proper motions are being made at the Cape.

The ordinary programmes have been supplemented by observations of IAU standard stars with the coudé spectrograph extending as far north as possible. A discussion of 70 coudé plates about equally divided between the  $6.8\text{Å}/\text{mm}$  and  $15.6\text{Å}/\text{mm}$  dispersions of IAU standards and Cape reference stars shows no systematic difference in velocity measures between the northern and southern hemispheres. At the suggestion of Heard, a short co-operative programme of observations of the stars HD 212943 and HD 171391, respectively a little north and south of the equator, was undertaken; the Cape result shows no definite systematic difference of measured velocity.

Other special programmes have included re-observation on the high dispersion coudé spectrograph of the triple star  $\rho$  Velorum and a rediscussion of the results using a new orbit for the visual pair kindly supplied by W. S. Finsen is in progress. Similar series of Coudé plates of I 365, also a star of higher multiplicity have served to emphasize the difficulties of dealing with these stars rather than to provide a solution. A number of other stars on the Cape programmes are also suspected to be of higher multiplicity than two.

The ordinary radial velocity programme has continued without incident. Fundamental Data for Southern Stars IV has appeared in print since the preparation of the last report (12). It contained radial velocities, spectral types and photometric data for 179 stars and space motions for 72 nearby dwarf stars. Some 400–500 velocities have since been completed. Three hundred of them are included in *Fundamental Data for Southern Stars V*, which also gives spectral types and photometric data for all the stars and space motions and co-ordinates for 66 which are nearby dwarfs. This list will probably be published before the General Assembly meets. Some of the Sub-dwarfs in this list have been included in a letter of comment on the identification of sub-dwarfs published in 'The Observatory'.

The rate of discovery of spectroscopic binaries continues high. At the time of writing about 68 cases are known where velocity variation is certain and another 21 doubtful. The policy adopted for determination of elements is one of concentration on a few selected stars until 12 spectra have been obtained, scattered through a period of 90 days. This is usually sufficient to provide an adequate indication of the velocity curve which can be refined by further observations at selected phases. Elements have been published or are in press for the stars HD 3405, 6619, 16589, 24202, 153890, 155555 and 197649. The compilation of observations of 24 single lined variables mentioned as being in press in the last report included elements for HD 141544. The coude spectrograph is proving useful in resolving spectra of multiple stars.

Since the last report a Newtonian spectrograph giving a dispersion of  $320 \text{ \AA/mm}$  with a camera of  $f/0.77$  has been brought into use on the Radcliffe reflector. Spectra have been obtained of several planetary nebulae, a few globular clusters, Comet Humason, and about 30 southern galaxies. After some initial difficulties this instrument seems likely to yield useful results in these fields. It is also intended to observe very faint individual stars but several problems of technique remain to be satisfactorily solved.

Those taking part in all the foregoing programmes and publication on the spectroscopic side have included N. W. W. Bennett, D. S. Evans, G. A. Harding, J. D. Laing, D. S. Malan, S. R. Malin, A. Menzies, T. W. Russo and R. H. Stoy.

*David Dunlap Observatory, Toronto*

Of the four programmes described in the *Transactions* for 1961, two can be considered to be complete, namely, the Alpha Persei Cluster programme and the Kapteyn Area Fundamental Stars programme. About a dozen stars of variable velocity have been found among the 55 KAFS stars. These, and other binary stars found in recently completed investigations, have been listed for further study. Observations are being continued on the stars in the Kapteyn Zones and on the OB stars. Many of the stars on the latter programme are near the limiting magnitude for the present prism spectrograph but a new grating spectrograph, nearing completion, may prove to be more efficient.

*B8–B9 Stars.*—For many of the stars in the Bright Star Catalogue with these HD spectral types there are no radial velocities. Velocity determinations have been initiated for about 250 of them whose declinations are north of  $-25^\circ$ . Observations are well advanced in the summer sky, less so in the winter right ascensions.

*Dominion Astrophysical Observatory, Victoria*

Two large radial velocity programs have been completed at Victoria as follows:

1. Radial Velocities of 570 B Stars by Petrie and Pearce (17).
2. Radial Velocities of 202 A and F stars lying within  $10^\circ$  of the north Galactic Polar Cap (Odgers and Petrie).

The publication referred to above has already been distributed. The analysis of the radial velocities is of interest to the work of Commission 33 and will be reported there. The work on

the stars at high galactic latitude has been delayed because of difficulties encountered in assigning spectroscopic distances to the stars involved. The radial velocities, therefore, have not yet been published.

Radial velocities are being obtained of members of the associations Cygnus I, II, III, and IV (Batten) of Cepheus IV (Walker) and of  $h, \chi$  Persei (Petrie). Observations have begun to give radial velocities of members of 12 galactic clusters.

Radial velocities of B- and A-type members (according to Heckmann, Dieckvoss, and Kox (29 ter)) of the  $\alpha$  Persei cluster are being obtained by Heard at the David Dunlap Observatory and Petrie at Victoria. This program is well advanced and will be completed in 1964.

The radial-velocity performance of the coudé spectrograph of the 48-inch telescope is being studied by means of spectra of the sky, Arcturus, and other standard-velocity stars. Three dispersions are available for radial-velocity observations using grating spectrographs. The linear dispersions are 2.2 Å/mm; 5.5 Å/mm, and 10 Å/mm. Results with the high dispersion are gratifying, the mean error of a radial velocity from one plate being  $\pm 0.12$  km/s.

#### *Radcliffe Observatory, Pretoria*

A third list of Radcliffe radial velocities of distant southern stars is in press (17bis). This comprises 122 stars down to  $m_v = 11$ , many with photometric distances believed to exceed 3 kpc. In a report to IAU Symposium 20, Thackeray presented a preliminary analysis yielding a value of the Oort constant  $A = 15$  (based on the MK scale of distances). Moreover, the galactic rotation curve exhibits a definite shift of the node in Carina ( $l^{II} = 270^\circ$ ), but the determination of  $R_0$  is invalidated by uncertainties in the local standard of rest. A value near  $R_0 = 9.0$  kpc can only be preserved by adopting Vyssotsky's 'basic' motion. Feast is investigating the K term among O and B stars.

Coudé spectra of a considerable number of distant B stars have been obtained for velocities of the interstellar gas. Some striking examples of double or multiple lines have emerged from this study.

P. W. Hill is measuring radial velocities of B stars out of the galactic plane.

40 members of the Sco-Cen association have been observed (Thackeray). Observation, measurement and reduction of velocities are essentially complete. Two double-lined binaries have been observed, HD140008 and 178322 (the latter not previously known to show two spectra) and material is available for orbital analysis. The binary HD185936 is being observed at the request of the Republic Observatory.

Radial velocities of the galactic clusters NGC4755 (25) and NGC6067 (26) have been published. Radial velocities of members of IC2944 have also been measured and being prepared for publication.

Feast is observing faint cepheids in Carina for velocity.

A spectroscopic orbit of the eclipsing variable AL Velorum has been derived by Wesselink (*M.N. RAS* in press).

Feast (81) has published radial velocities of 114 Me Variables including 86 for which velocities are available for absorption as well as emission lines. A new mean relation between absorption and emission velocities is derived. He confirms Merrill's correlation of velocity (corrected for solar motion) and velocity dispersion with period, but points out that variables with periods 100–150 days appear to form a separate group, having characteristics with those of longest period. Velocity ellipsoid and density gradients are derived for groups of various periods.

Feast (*M.N. RAS* in press) has measured coudé velocities of nebulae in the Magellanic Clouds

and undertaken a new analysis of the rotation of the Large Cloud. A small group of the bolometrically brightest stars have large residual velocities which distort an otherwise gaussian distribution.

Further spectroscopic observations of members of both Clouds are being undertaken, including new members discovered by Fehrenbach on objective prism spectra. A particular effort is being made to strengthen velocities in the Small Cloud. The Radcliffe system of radial velocities in the Clouds has received some confirmation from three coudé spectra (Thackeray) (36bis). A violet shift of the K line in the brightest star in each Cloud has been observed (as in galactic supergiants) and is probably associated with an expanding shell.

#### *Royal Greenwich Observatory*

Le Dr Pagel a mis en route un programme de détermination de Vitesses Radiales qu'il décrit de la façon suivante:

The stars observed included about 450 HD stars of spectral type B<sub>9</sub>-A<sub>5</sub>, north of the celestial equator, brighter than 6<sup>m</sup>35, which had radial velocities of quality 'c' or worse in Wilson's catalogue.

The observations were made in the period 1960 October to 1962 June, using a one-prism spectrograph at the Cassegrain focus of the Yapp 36-inch reflector at Herstmonceux.

Normally four spectrograms were taken of each star, with additional observations for standard stars and suspected velocity-variables.

The measurement of the plates has been completed and the results reduced by a variety of methods. The data are now being transferred to punched cards in order to systematize the reductions and to facilitate the necessary statistical investigations.

The spectra are being examined visually and classified according to spectral type, luminosity, and rotational broadening of lines. This information will also be recorded on punched cards for analysis in various ways.

#### *Mount Stromlo Observatory*

The observations for the major radial velocity programmes (fundamental southern stars, Scorpio-Centaurus Association, IC2602) have been completed (H. Gollnow, A. Przybylski). The measurements and reductions are in progress (H. Gollnow, P. M. Kennedy, M. Mowat, A. Przybylski).

P. M. Kennedy and A. Przybylski have completed measurements of the radial velocities of 50 high-velocity stars, and these are in press (71). The radial velocities of 50 stars of high proper motion are completed, and work is continuing on many other stars of this type.

P. M. Kennedy is determining radial velocities for A-type stars near the South Galactic Pole.

Spectra of stars in three fields along the Southern Milky Way (at longitudes 245°, 312°, 328°) have been obtained with the new Nebular Spectrograph by B. J. Bok, H. Gollnow and M. Mowat. The observations are being continued and the measurements for radial velocities are in progress. Attention is also being given to the interstellar K-lines.

B. J. Bok, H. Gollnow, M. Mowat and B. Westerlund are studying emission nebulae in the Magellanic Clouds. The observations in the Small Cloud are carried out in co-operation with J. V. Hindman of Radiophysics Laboratory, Sydney.

The accuracy of the radial velocity measurements has been greatly improved by the impersonal setting device (H. Gollnow), particularly for early type stars (9).

#### *The Australian National University, Canberra*

*Radial velocities of fundamental southern stars, II (11).* Newly determined radial velocities

are given for 15 standard velocity stars and 115 other bright stars south of the equator. Measurements from two-prism spectrograms (dispersion  $90 \text{ \AA/mm}$  at H-gamma) taken at the Newtonian focus of the 74-inch reflector are now entirely consistent with velocities determined elsewhere. Most of the present data are from the 30-inch Cassegrain spectrograph (dispersion  $36 \text{ \AA/mm}$  at H-gamma).

Nearly all the stars in this list are in the FK3 and N30 position catalogues, of the fifth and sixth visual magnitude. At least three spectrograms of each star have been measured. 34 new constant velocities are announced and variability has been detected for the first time in 23 other stars. Observations have been resumed on 33 stars previously known to have variable velocity. A luminosity class on the revised Yerkes system is assigned where possible.

*Radial velocities of bright southern stars, III (17 ter).* Newly determined radial velocities are given for 80 stars of southern declination. In addition to stars of FK3 and N30 catalogues, and a few late-type dwarfs of large proper motion, the list includes a group of 25 B and A stars near the south galactic pole and 10 metallic-line stars.

*Supergiant B stars in the small Magellanic Cloud (33).* For each of the eight brightest blue member stars in the SMC, velocities are given from two  $90 \text{ \AA/mm}$  spectrograms, with classifications on the MK system and measured equivalent widths of the strongest hydrogen and helium lines. No differences could be detected between these spectra and those of supergiants of luminosity class Ia in the southern Milky Way. Radial velocities from spectra of standard-velocity stars on each night of observation are listed, as well as those of five foreground blue stars in the SMC field and one emission nebula in the Cloud.

*The Scorpio-Centaurus Association, III et IV (24).* Newly determined radial velocities are given for 65 B stars and five A stars, mostly in the magnitude range 5.0 to 7.2. Most of the stars have been classified on the revised Yerkes luminosity system. 27 new constant velocities are announced and 11 with variability detected for the first time. Observations have been resumed on 30 stars previously reported as variable in velocity. The remaining data confirm results previously obtained elsewhere.

From measures of the sharp K line in the spectra of 600 and early B-type stars, radial velocities are derived for interstellar calcium clouds, mainly within a few hundred parsecs of the Sun. In directions where these clouds apparently coincide with neutral hydrogen at the same distance, there is close agreement between optical and radio velocities (with P. Morris, P. M. Kennedy).

#### *Kitt Peak National Observatory*

Radial velocities are being obtained at Kitt Peak National Observatory with a Cassegrain spectrograph attached to the 36-inch reflector and, temporarily, to the 84-inch reflector. This spectrograph gives dispersions of 128 and  $63 \text{ \AA/mm}$ ; it is normally used with slit dimensions projected onto the plate of 6 microns by 0.3 mm. The accuracy of the velocities for these two dispersions is 3.9 and 2.1 km/sec, respectively, p.e. per plate and nearly independent of line widths. The exposure times at the 36-inch are two and six minutes, respectively, for stars of  $B = 7.0 \text{ mag}$ .

The radial velocities are currently measured with an oscilloscope-type measuring engine made by Grant Instruments of Oakland, California, U.S.A. This instrument is digitized and the output is reduced on an electronic computer. The normal measuring and reduction times per spectrogram are five-and-a-half minutes, respectively.

The following are completed or in-progress radial-velocity projects by the undersigned:

(1) the discrepancy between radio and stellar radial velocities is being investigated on the basis of new stellar radial velocities in the Perseus Arm. Measurements (29bis) of 45 OB supergiants and giants near  $l^{\text{II}} = 100^\circ$  showed that half of these stars are spectroscopic binaries.

The constant-velocity stars give a mean velocity ( $-50.1 \pm 1.5$  km/sec, corrected for solar motion) which agrees with the corresponding radio velocity ( $-51.5$  km/sec), whereas the mean velocity from three measures of each of 21 spectroscopic binaries gives  $-34.5 \pm 3.7$  km/sec. These stars are of the types that show a marked non-random distribution of longitudes of periastron. It is suggested that early-type stars off the main sequence frequently have gaseous streams that distort their velocity curves, producing, among other things, incorrect mean velocities.

This work is being continued to obtain complete velocity curves of these stars, as well as for 26 members of the I Perseus Association.

(2) The frequency of binaries among the 46 brightest stars in the Pleiades is being determined from approximately 600 spectrograms. To date no short-period (less than 100 days) spectroscopic binaries have been found among the 13 brightest (B6 – B9) members; this result is probably correlated with the unusually high rotational velocities of these stars.

(3) The frequency of binaries among the 75 brightest (O9 – B3) members of the I Orion Association is being determined from  $63 \text{ \AA/mm}$  spectra.

(4) Radial velocities have been determined from 167 spectra ( $128 \text{ \AA/mm}$ ) of 33 stars in the galactic cluster IC4665. 46 velocities of 12 stars in the galactic cluster NGC457 have been obtained.

(5) The binary characteristics of 55 field A4–F2 IV and V stars are being determined from  $18 \text{ \AA/mm}$  McDonald coude spectra and  $20 \text{ \AA/mm}$  Mount Wilson 60-inch reflector spectra. These stars are in the region of the H-R diagram that is also populated by the metallic-line stars; it was previously concluded (84) from similar material that all metallic-line stars are members of spectroscopic binaries. Preliminary results, based on 381 radial velocities of 37 stars published velocities, show that 17 of these normal stars are spectroscopic binaries but that their periods are greater than 100 days in every case. Evidently if stars in this region of the H-R diagram are members of binaries with periods less than 100 days, their spectra are 'metallic-line'.

#### *Observatoires de Marseille et de Haute-Provence*

Ces deux Observatoires sont engagés dans des mesures très suivies de vitesses radiales que l'on peut classer en trois grands chapitres suivant les techniques utilisées:

A.—*Mesure avec spectrographe à fente.* 1.—Détermination de vitesses radiales d'étoiles standard et de divers programmes avec les spectrographes du télescope de 120 cm et surtout du télescope de 193 cm (Foyer coude) MM. Fehrenbach, Boulon, Baranne, Prévot, Mme Rebeiro, Mlle Pillet.

Les Vitesses Radiales servent surtout à l'étalonnage des clichés du Prisme-Objectif. (15), (20).

De nombreuses nébuleuses planétaires ont été mesurées par Mlle M. Chopinet (18), (19).

2.—Des mesures de V.R. et de rotation de nébuleuses extragalactiques sont effectuées par Mme R. Duflo avec les spectrographes classiques  $f/1$  et  $f/2$  ou la Caméra Electronique (45, 46, 49, 51, 52). Un spectrographe ouvert à  $f/0.47$  est maintenant en service.

B.—*Mesures de vitesses radiales au prisme objectif* (37 à 43 bis). Trois prismes objectifs de ce type sont actuellement en service. Un, de 15 cm de diamètre (PPO), et deux de 40 cm de diamètre (GPO 2 et GPO 3). Le GPO 2 a fonctionné de 1959 à 1961 à l'Observatoire de Haute-Provence; il est installé depuis Juin 1961 à la Station Française à Zeekoegat en Afrique du Sud, dans le cadre de l'ESO (European Southern Observatory). Le GPO 3, de même type que le GPO 2, l'a remplacé à l'Observatoire de Haute-Provence en octobre 1961.

1°.—Le prisme de 15 cm, PPO.—

Il permet d'atteindre la 10-ème magnitude. Les champs étudiés avec le PPO sont pour la

plupart ceux du programme du GPO. Il est très difficile en effet de trouver dans les catalogues des vitesses radiales d'étoiles entre la 9-ème et la 12-ème magnitude pour étalonner les résultats du GPO. Notons que nous avons même des difficultés pour étalonner les résultats du PPO.

Ont été publiés:

Les résultats pour 481 étoiles dans le plan galactique (champ 7 et 'Selected Areas' de Kapteyn (8, 40, 64, 74);

Les résultats pour 29 étoiles près du pôle galactique (SA 57);

Les résultats pour 174 étoiles dans la région de l'association d'étoiles OB du Cygne.

Les résultats pour 24 étoiles autour de  $\delta$  Tau.

D'autre part, nous possédons les résultats pour 734 étoiles situées dans les 'Selected Areas' 9, 29, 41, 67, 90, 91 et dans 5 champs situés dans le plan galactique. Mais nous avons retardé leur publication par suite de l'absence de vitesses radiales de qualité suffisante pour les étalonner.

2°—Le prisme de 40 cm, GPO 2—

Il permet d'atteindre la 12-ème magnitude.

Ont été publiés:

Les résultats de 358 étoiles dans les 'Selected Area' de Kapteyn 8 et 19 (plan galactique).

Les résultats de 21 étoiles près du pôle galactique (SA 55).

Les résultats des SA 11, 15 et ceux d'un champ situé dans le plan galactique, FG 1 (234 étoiles) seront publiés dès que nous aurons des vitesses radiales de référence.

Depuis son transfert en Afrique du Sud, de nombreux clichés (environ 500) ont été pris essentiellement dans les Nuages de Magellan et dans la Voie Lactée. La méthode du prisme objectif à champ normal s'est révélée excellente pour la détection des étoiles membres des Nuages de Magellan (voir Commission 28, rapport sur les Nuages de Magellan).

Un champ de  $2^\circ \times 2^\circ$  dans Carina a permis la détermination de 303 vitesses radiales, mais nous n'avons aucune étoile à vitesse radiale connue dans cette aire pour étalonner l'ensemble. Deux autres champs, un dans Carina, l'autre autour de  $m$  Cen sont en cours de mesure.

D'autre part, la simple inspection de nos clichés nous a permis de déceler deux étoiles dont la vitesse radiale dépasse 200 km/s. Une de ces étoiles, proche de l'amas  $\omega$  Cen, fait très probablement partie de l'amas bien que sa situation dans le diagramme HR soit surprenante.

3.—Le prisme objectif de 40 cm, GPO 3.

Les programmes commencés avec le GPO 2 sont poursuivis avec le GPO 3: champs galactiques, champs au pôle galactique, 'Selected Areas' de Kapteyn.

Les résultats obtenus avec les Prismes Objectifs ont permis trois études générales de mouvements stellaires: Mme M. Duflot (37) a discuté la structure de la Voie Lactée dans la région de la S.A. 19 ( $\alpha = 23^{\text{h}} 26^{\text{m}}$ ;  $\delta = 59^\circ 47'$ ) et la propriété cinématique dans ce champ de petite latitude galactique. Le résultat le plus intéressant est la répartition très différente des V.R. pour les étoiles BAF d'une part et GKM d'autre part. Pour ces dernières on note l'existence d'une forte proportion d'étoiles avec des V.R. de l'ordre de  $-60$  km/s alors que pour les étoiles de type peu avancés, ces étoiles sont très rares.

Mme M. Barbier (39) a étudié de façon analogue la région entourant P Cyg et a montré que l'ensemble des étoiles appartient à deux bras de la Galaxie. Aucune variation systématique de la V.R. avec la distance n'apparaît.

Enfin J. Boulon (43bis) dans un travail très approfondi a rediscuté l'ensemble des V.R. obtenues avec nos Prismes-Objectifs pour les champs de petite latitude galactique. Il s'est servi de ces résultats pour déterminer l'apex du mouvement solaire et la valeur de la constante  $A$  de Oort.

Les discussions de ce travail montrent que les V.R. obtenues aux Prismes Objectifs sont exemptes d'erreurs systématiques et permettent de très bonnes déterminations des constantes des mouvements galactiques. M. Boulon discute la signification du terme K.

La fréquence anormale des étoiles GK à V.R. relativement grande en valeur absolue, trouvée dans un champ par Mme Duflot, est confirmée.

#### C.—Méthodes interférentielles

Utilisant les méthodes interférentielles classiques (Pérot-Fabry), le programme de mesures de Vitesses Radiales des régions H II a été poursuivi dans la Voie Lactée Nord par G. Courtès et P. Cruvellier. Ils se sont attachés à la recherche des régions H II lointaines (31). Ces recherches ont été possibles grâce au télescope de 193 cm de l'Observatoire de Haute-Provence, équipé d'un réducteur focal ayant un rapport d'ouverture de  $f/1$ .

D'autre part, à Zeekoegat, (Afrique du Sud), dans le cadre de l'Observatoire Européen Austral, P. Cruvellier utilisant les mêmes méthodes interférentielles a mesuré la Vitesse Radiale des régions H II situées entre  $l^{II}$  270 et  $0^\circ$  (2). Deux bras spiraux semblent se dégager nettement entre ces longitudes.

Il semble, par ailleurs, que la répartition des vitesses dans la direction du centre galactique est conforme à la théorie de la rotation différentielle de la galaxie, sauf que les vitesses radiales ne s'annulent pas complètement dans la direction même du centre. Il semble que les points se répartissent sur une courbe parallèle à la courbe reprenant l'effet de rotation pour trois kiloparsecs. Cette courbe donne une vitesse radiale nulle pour une longitude voisine de  $350^\circ$ .

Les résultats obtenus dans l'hémisphère Nord aussi bien que dans l'hémisphère Sud, sont en bon accord avec les résultats radioastronomiques obtenus avec la radiation de 21 cm.

#### Observatoire de Toulouse

L'Observatoire de Toulouse a mis en route des mesures de vitesses radiales à la fois avec un nouveau prisme objectif de Fehrenbach et avec les méthodes classiques. M. Bouigue décrit ces programmes de la façon suivante:

—mesures systématiques de V.R. d'étoiles de repère pour les clichés du PO, avec le nouveau spectrocomparateur (8). Ces mesures ont porté jusqu'à présent sur des étoiles signalées par M. Boulon pour les clichés de Marseille. La série est sur le point d'être terminée.

—recherches d'étalons pour la mesure des V.R. d'étoiles O, B et A. De nombreux clichés ont été pris à cet effet au spectrographe C au cours des dernières missions et les mesures sont en cours; la méthode de superposition des enregistrements de spectres est en effet très indiquée pour ces types d'étoiles.

*Nota:* L'utilisation du spectrographe C a été poursuivie en vue de l'exploitation des nombreux spectres déjà pris avec ce spectrographe. Ultérieurement, l'utilisation d'un autre spectrographe est envisagée (spectrographe à réseaux monté sur notre télescope).

—travaux envisagés: Utilisation du prisme-objectif de 25 cm, pour l'étude de champs galactiques, en collaboration avec l'Observatoire de Marseille.

Les premiers résultats concernant les mesures en cours seront publiés courant 1964.

Je pense qu'il convient surtout d'attirer l'attention de nos collègues sur la rapidité et la précision des mesures effectuées avec ce spectrocomparateur.

#### Observatoire de La Plata

J. Sahade indique des mesures d'étoiles doubles pour les étoiles suivantes:

$\gamma$  U Mi,  $\zeta$  Hor (doubles spectroscopiques), HR 4511, V 453 Sco, et  $\gamma_1$  Vel.

Les étoiles suivantes sont observées: HD 698, PGC 4444, AM Leo et  $\beta$  Lyr.



*Divers*

Enfin, Ann B. Underhill a publié des vitesses radiales des étoiles supergéantes suivantes: 67 Oph, 55 Cyg et  $\chi^2$  Ori dont les valeurs varient irrégulièrement dans un intervalle de 30 km/s.

M. Vandekerckhove a commencé des mesures de vitesses radiales d'étoiles B à Bruxelles.

## CONCLUSIONS

L'examen de ces nombreux rapports montre que l'activité dans le domaine des mesures de vitesses radiales a été assez grande depuis la réunion de l'UAI à Berkeley. Plusieurs milliers de nouvelles mesures ont été publiées et de très nombreuses déterminations sont prêtes pour la publication.

Les recherches ont été particulièrement actives dans l'hémisphère austral (Cape-Observatory, Radcliffe, Mt. Stromlo, Canberra et Station Européenne en Afrique du Sud). Cette situation est très réjouissante, car le manque de données dans cette partie du ciel était particulièrement sensible.

Aux observatoires déjà engagés dans l'hémisphère boréal (Victoria, David Dunlap, Haute-Provence-Marseille) se sont ajoutés les observatoires de Kitt Peak et de Toulouse.

Les programmes comprenaient des mesures systématiques d'étoiles proches ou, au contraire, d'étoiles très lointaines. Les études systématiques d'astres particuliers n'ont pas manqué. Des recherches en vue d'accélérer les méthodes de dépouillement sont également poursuivies.

Certes les mesures systématiques extragalactiques paraissent avoir été un peu négligées. Seules les mesures de M. Mayall et les études de rotation des galaxies de Mme et M. Burbidge et de Mme Duflot-Augarde font exception. Mais de nombreuses mesures sont en préparation.

Je crois pouvoir conclure que l'activité dans le domaine des V.R. après une nette diminution au cours des années précédentes, est maintenant en nette progression.

CH. FEHRENBACH  
*Président de la Commission*

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#### REPORT OF THE COMMITTEE ON STANDARD VELOCITY STARS

A suitable number of Standard Velocity Stars of spectral types F to M appears to be provided by the lists in the report of (former) sub-commission 30a (*Trans. IAU*, **9**, 411, 1955). It is worthwhile however, to continue surveillance of these stars and additional observations should be made, if possible, with very high dispersion. The coude spectrograph at Victoria will be used to obtain additional radial velocities for some of the stars. Radial velocities of four standards have been determined by F. Gutmann at Victoria with coude dispersion of 5.5 Å/mm. The results are:

$\beta$ Geminorum	+ 3.1 $\pm$ 0.2 km/sec
$\alpha$ Bootis	- 5.4 $\pm$ 0.2 ,,
$\gamma$ Aquilae	- 1.4 $\pm$ 0.3 ,,
$\iota$ Piscium	+ 5.5 $\pm$ 0.2 ,,

Solar wavelengths are used for the stellar lines and iron arc standards as recommended by Commission 14 (*Trans. IAU*, **9**, 218, 1955) for comparison lines. The radial velocity of  $\gamma$  Aquilae, above, is not in good agreement with the recommended value and may be variable.

The emphasis on velocity standards is now shifting to the important matter of the inter-comparison of results obtained in the southern, and northern, hemispheres. An investigation by D. S. Evans on 'Radial Velocity Measures of Standard Stars with the Radcliffe Coude Spectrograph' (in press) has shown that no systematic difference exists between northern and southern stars. W. Buscombe and P. M. Morris similarly have found agreement between Mt. Stromlo velocities (*M.N. RAS*, **118**, 609, 1958) of southern solar-type stars and those previously published. Radial velocities of thirty-five B stars observed at Pretoria and Victoria show excellent agreement between the two sets (*Publ. Dom. astrophys. Obs.*, **12**, 1, 1962). There is thus reason to believe that the northern and southern radial-velocity systems agree, but comparisons should be continued.