

30. RADIAL VELOCITIES (VITESSES RADIALES)

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1. CATALOGUES

The *Bibliography of Stellar Radial Velocities* (Abt and Biggs, Kitt Peak Nat. Obs., 1972) is proving very useful. Abt has also published the second instalment of his *Catalog of Individual Radial Velocities measured by Astronomers of the Mount Wilson Observatory* (*Astrophys. J. Suppl.* 26, 365, 1973). Dommanget reports that he is about to publish a new edition of his *Catalogue d'Éphémérides des Vitesses Radiales relatives des composantes des étoiles doubles visuelles dont l'orbite est connue*; the attention of radial-velocity observers is drawn to the value, especially as regards the determination of stellar masses, of systematically observing the components of these visual binaries. Pedoussaut and collaborators at Toulouse will shortly publish the *13^e Catalogue Complémentaire de Binaires Spectroscopiques*. They have made a card catalogue of all binaries reported in Catalogues 1–13 (1952–1976); it is on file at the Strasbourg Centre de Données Stellaires. There is no news of the supplement to the General Catalogue of Radial Velocities which was reported as approaching completion in 1970. The de Vaucouleurs and Corwin have analysed all available optical and radio redshifts of galaxies (4000 observations, 2500 galaxies) and reduced them to a common system in preparing the Revised Bright Galaxy Catalogue, to be published by the University of Texas Press in 1976.

2. INSTRUMENTATION

Photoelectric radial-velocity spectrometers are in operation or being built at Victoria (Fletcher), Herstmonceux (Jones), Fick (Beavers), Cape (Balona) and Geneva (Mayor), as well as those already reported at Cambridge and Palomar. Fehrenbach has installed a new 'prisme objectif à champ normal' on a 60-cm Schmidt at OH-P, giving a dispersion of 195 \AA mm^{-1} .

Several observatories have reported new or improved conventional spectrographs, automation of measuring machines, development of relevant computer programmes, etc.

Serkowski continues to propose new instruments and is actually making a polarimetric radial velocity meter (*Icarus* 27, in press).

3. STELLAR RADIAL-VELOCITY STANDARDS

The 21 new standards adopted by the Commission in 1973 are being re-observed by Heard in an effort to detect or rule out velocity variations on a 10-year time scale. Griffin (*Monthly Notices Roy. Astron. Soc.* 171, 407, 1975) has observed 12 of the stars and recommends velocities marginally different from those adopted; HD 14969 is a spectroscopic binary and should be rejected. Heard and Fehrenbach have collaborated in observations of a second list, of 37 late-type stars of about 8^m. Maurice (Marseille – ESO) has observed 7 stars from Evans' suggested list (*Trans. IAU* 13B, 170, 1968) and finds velocities systematically more positive by 6 km s^{-1} !

4. SPECTROSCOPIC BINARIES

Although one of the major purposes of stellar radial-velocity measurement is the determination of the orbits of spectroscopic binaries, the overlap of interest between Commission 30 and Commissions 26 (Double Stars) and 42 (Close Binaries) is such that the reports of all three commissions must either be incomplete or contain substantial duplication. This report simply summarises the work which has been reported to Commission 30 on spectroscopic binaries.

The Allegheny SB observations continue. Beardsley and collaborators have published an analysis of HR 4550 (*Astrophys. J.* 194, 637, 1974), and have described work on κ Peg, θ Vir, DV Aqr, μ Cas and β Per (all in *Bull. Am. Astron. Soc.* 7, no. 4, 1975); they are about to publish results on γ Gem and η Ori. Sahade reports investigations by Buenos Aires and La Plata astronomers of β Mon A, β Aps, 25 Cru, B 4444, and ϵ CrA; papers have been published on π Aqr (*Astrophys. J.* 189, 285, 1974) and HD 92740 (*Publ. Astron. Soc. Pacific* 85, 220, 1973). Fraccasini *et al.* (*Astron. Astrophys.* 37, 179, 1974) have published elements for 16 Psc. Heard and collaborators have given orbits for HD 82191 (*J. Roy. Astron. Soc. Can.* 67, 306, 1973), HD 11291 and HD 153720 (*J. Roy. Astron. Soc. Can.* 69, 22, 1975) and 4 Her (*Astron. Astrophys.* 42, 47, 1975); work on HD 152224, 186547, 190658, 214946, 216494 and 225093 is well advanced. Bolton and co-workers have obtained new or revised orbits for HDE 226868 = Cyg X-1 (*Astrophys. J.* 200, 269, 1975), HD 12323, 21364 (a spectroscopic triple), UU Psc, b Per, HD 104451, 135679, 193516, 213534, 218154, and HDE 235675; other binaries under investigation are DR Vul, HR 6611, HD 86590, 112014, 151676, 190918, 201433, ϕ Dra, AR Aur, ES Lib, σ Ori AB, and FK Com. Pedoussaut and collaborators have published orbits for HD 92168 (*Astron. Astrophys. Suppl.* 15, 133, 1974) and HD 166181 (*Astron. Astrophys.* 37, 191, 1974). A paper on HD 160861 is in press, and work on HD 4676 and 22403 is nearly complete. Observations on HD 107325 continue in France, England and North America; Fehrenbach's orbit from objective-prism data is now discredited. Hube has continued his work on late-B-type spectroscopic binaries, observing at DDO and DAO; as well as studying possible systematic differences between different observatories' measurements of broad-lined stars (*J. Roy. Astron. Soc. Can.* 68, 143, 1974), he has published orbits for HD 180553 (*Astron. Astrophys. Suppl.* 10, 267, 1973) and 193964 (*J. Roy. Astron. Soc. Can.* 67, 161, 1973), while papers on HD 170200 (*Publ. Astron. Soc. Pacific*) and 192276 (*J. Roy. Astron. Soc. Can.*) have been submitted. He is observing HD 1256, 14055, 16219, 24769, 63655, 74393, 83650, 115612, 146416, 169578, 169820, 174853, 182255, 187640, 192659, 194939, 199892, 219634, 219749, 220318, 220575 and 222133. Thackeray and collaborators have published orbits for AR Pav (*Monthly Notices Roy. Astron. Soc.* 167, 319, 1974) and α Cru (*Monthly Notices Roy. Astron. Soc.* 168, 55, 1974). Griffin, in collaboration with Emerson and Radford, has begun a series of SB orbits in *Observatory*. Published so far (in vols. 95 & 96) are HD 45088, 9313, HR 8035, HD 204934, HR 1970, HD 183629 and 160952; about 100 other late-type binaries are under observation.

5. RADIAL VELOCITIES OF STARS

Victoria. Crampton and Fisher have measured RVs for 57 OB stars in H II regions (*Publ. Dominion Astrophys. Obs.* 14, 283, 1974). Crampton has also been studying radial velocities of clusters, including Ma 50 and IC 4665. Hill, with several collaborators, has completed a programme on North Galactic Pole stars and is now working on the South Galactic Pole. Selecting and testing of standard wavelengths for the new spectrographs of the 1.8-m telescope is nearly complete.

David Dunlap. Heard and Colson have re-observed the bright components of 23 8^m visual binaries first observed in 1955/56. Only one could be definitely established as a spectroscopic binary. Heard's unpublished velocities of 12 Lac have been combined by Percy with older data, and a period change of 0.4 per century has been derived. Rogers, in a study of the radial velocities of the OB C and N stars, has found that all of the OBN stars are binaries whereas the OBCs are not.

Radcliffe. Kilkenny and Hill (*Monthly Notices Roy. Astron. Soc.* 172, 649, 1975) have published RV's of 68 early-type stars at intermediate galactic latitudes. Wood has observed samples of HD B8 and B9 stars in the galactic plane near longitudes 225° and 315° (for galactic rotation parameters) and in the direction of the Scorpio-Centaurus Association. Thackeray (*Observatory* 95, 100, 1975) has compiled a list of 69 galactic objects with heliocentric RV's of 250 km s^{-1} or more, bringing the Abt-Biggs bibliography up to date in this respect. He also (Strasbourg Centre de Données Stellaires, *Inf. Bull.* 9, 3, 1975) points out that the lack of radial velocities for some bright southern stars (*Inf. Bull.* 8, 3) is due not to inactivity but to concentration of limited resources on matters of specific astrophysical interest.

U.S.S.R. Eelsalu reports that grating spectrographs on the 2-m Shemaha telescope, and the 60-cm at Zelenchuk, have been used to study differential shifts in the spectra of bright early-type supergiants and Be stars, as reported to the European meeting at Tbilisi, 1975, by Chentsov. Aslanov *et al.* (*Shemaha Circ.*, 39, 1975) have measured 23 O-B3 stars brighter than 8^m and belonging to the association Cep OB2.

France. Fehrenbach and Duflot (*Astron. Astrophys. Suppl.* 13, 173, 1974) have published objective-prism velocities of 398 stars in the LMC and 1434 foreground stars; some of them were identified earlier (*Astron. Astrophys. Suppl.* 10, 231, 1973) but no velocities were given then. Carozzi (*Astron. Astrophys. Suppl.* 16, 277, 1974) has investigated high-velocity stars amongst the foreground objects. Fehrenbach (*Astron. Astrophys. Suppl.* 16, 359, 1974) gives velocities for 50 stars from slit spectrograms. Berger *et al.* (*Compt. Rend. Acad. Sci. Paris B* 278, 227) have obtained velocities for 100 blue stars at high galactic latitudes.

Tokyo. Yamashita (*Ann. Tokyo Astron. Obs.* 13, 169, 1972; 15, 47, 1975; *Publ. Astron. Soc. Japan*, 26, 159, 1974) gives RVs for 35 carbon stars previously unmeasured.

Mount Stromlo. Mould has measured RVs of 15 faint M dwarfs.

Herstmonceux. Harding, with Balona of SAAO, is studying velocity curves of southern Cepheids and RR Lyr stars.

Dudley. Davis Philip has measured RVs for six possible members of the Magellanic Stream (*Bull. Am. Astron. Soc.* 6, 440, 1974).

Palomar. Gunn and Griffin have measured RVs of substantial numbers of individual stars in globular (M3, 5, 10, 13, 22, 92) and galactic (Hyades, M11, M67, NGC188) clusters with the photoelectric spectrometer (*Astrophys. J.* 191, 545, 1974). For the first time, the accuracy is high enough to permit discussion of the internal motions of clusters. Many spectroscopic binaries have been recognised in the galactic clusters.

Cambridge. Griffin has re-measured, in each season 1973/4/5, about 80 of the 'Redman K stars' observed in 1966 and 1969 (*Monthly Notices Roy. Astron. Soc.* 148, 211, 1971); additional velocity variables have been recognised in this sample. He has obtained RVs for more than 300 9^m HD K0 stars chosen by Clube at galactic latitudes $\pm 45^\circ$. Radford & Griffin have observed all HD stars of type K0 and later, and many of the G5 stars, within 15° of the North Galactic Pole.

6. RADIAL VELOCITIES OF GALAXIES

U.S.S.R. RVs have been measured for 240 Markarian galaxies and 70 objects from Karachentsev's catalogue of isolated pairs. The observations have been made at Zelenchuk (70-cm aperture, 250 \AA mm^{-1}), Alma-Ata (70-cm, 350 \AA mm^{-1}) and Crimea (2.6 m, 360 \AA mm^{-1}). Results are published as follows: Karachentsev *et al.*, *Astrofizika* 10, 441, 1974; *Astron. Astrophys.* 41, 375, 1975; Denisjuk *et al.*, *Astrofizika* (in press); *Astr. Circ.* 798, 1973; Kopylov *et al.*, *Astrofizika* 10, 483, 1974; *Astrofizika* (in press); *Astr. Circ.*, 755, 1973. At Moscow (Sternberg), Lozinskaya (*Astron. Zh.*, 52, 39, 515 & 682, 1975, and elsewhere) has studied with interferometric equipment the RV fields of some galactic emission nebulae and supernova remnants. New developments in RV measurements of galaxies are to be expected when the 6-m telescope is brought to bear on them.

McDonald. G. and A. de Vaucouleurs have obtained spectra of ~ 100 galaxies and compact objects at $180\text{--}360 \text{ \AA mm}^{-1}$ with an image-tube spectrograph on the 2-m reflector. Ha

interferograms ($p = 1060$) of ~ 25 galaxies have been obtained with an image-tube Fabry-Pérot. In collaboration with Pence they have used digital reduction of area-scanned spectrograms and interferograms to map the velocity field of NGC 1569 (*Astrophys. J.* 194, L119, 1974).

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