26. COMMISSION DES ETOILES DOUBLES

Report of Meeting, 25 August 1967

PRESIDENT: K. Aa. Strand.
SECRETARY: J. Dommanget.

In opening the meeting, *the President* announced with regret the death of Dr E.L. Martin and Dr R.M. Petrie, both of whom had been active members of the Commission. Dr Petrie had also been a member of the Organizing Committee.

The appointment of Dr P. Couteau, as President, and Dr J. Dommanget, as Vice-President, as proposed by the Executive Committee, was approved. An Organizing Committee, consisting of Eggen, van de Kamp, Kulikovsky and Strand was approved.

The Draft Report was adopted with the correction of a few misprints.

The President reported the following additions to the Draft Report, which were received after its preparation:

(1) Dick had provided the information that Horst Pauscher and Karl-Heinz Hintze had carried out observations, with the 65-cm Babelsberg refractor, which were published in Veröff. Sternw. Babelsberg, **XV**, Heft 4.

(2) Wieth-Knudsen had constructed a new double-image micrometer for telescopes with a focal ratio of 1/7·5.

(3) Wierzbiński had prepared a catalog of Δm's for 2535 pairs concerning 2379 binary systems. He also reported that Bem had started systematic observations with a 20-cm refractor at the Wroclaw Astronomical Observatory.

(4) Hopmann had expressed his regrets that a number of refractors suitable for double star observations were not being utilized.

Dommanget reported that the 45-cm refractor at Uccle had been provided with a new objective from Zeiss, and that a new observing program had been established.

Couteau announced the replacement of the 38-cm refractor at Nice with a 50-cm refractor, furnished by the Paris Observatory.

Djurkovic reported on his activities at the Observatory at Belgrade. The observations made between 1961 and 1964 would be published in *Bull. Obs. astr. Beograd*, **26**, No. 1 (1967).

The President reported that proceedings of the colloquium 'On the Evolution of Double Stars', held at Uccle in September 1966, had been published (*Commun. Obs. r. Belgique*, Ser. B, No. 17, 1967). He expressed his thanks to Dommanget, as the editor, for the expeditious publication of the proceedings.

On the basis of a proposal by *Couteau*, the Commission approved a resolution to hold a colloquium at Nice in the fall of 1969 on the subject of different methods of observing double stars.

On the proposal by *Couteau* for the establishment of a working group to periodically select and publish a list of orbits considered definitive or well-determined, it was felt that the information in the orbit catalogues, usually giving the quality of the orbit, would provide the necessary information.

It was also suggested that consideration be given to reporting such orbits in the Information Circular published by Muller, but the Commission decided not to take action on this proposition.

Muller reported that he intended to continue publishing his catalog of ephemerides, as he had done in the past.

Couteau called attention to the variation in the delays in publication of observations. Certain observers grouped long series of ten or more years into one publication, while others published their measures at frequent intervals, sometimes annually. In the case of lengthy delays in publi-

cation, *Couteau* would like the authors to provide the observations ahead of publication to certain members of the Commission, to whom others could address themselves.

Strand and *Worley* felt that it would not pay to include unpublished observations in the General Catalogue because of the extra work involved, and especially because of the inevitable mistakes which would occur when provisional means were replaced with final ones.

It was unanimously agreed that it was necessary to accelerate the frequency of publications, preferably after each series of measures have been completed.

In regard to his proposal of new surveys, *Worley* remarked that the great discovery surveys of double stars were carried out many decades ago, and, in particular, much of the sky north of + 60° declination was searched with only a 12-inch refractor. Many double stars could be discovered today by a repeat of at least part of the sky with a telescope of reasonable size, and this would also provide some measure of completeness of the original survey.

In addition, the importance of surveys of special kinds of objects, such as variable stars or nearby stars, was stressed.

Couteau reported that during a three-year period at Nice he had examined 8400 stars between + 18° and + 24° of declination at the rate of 80 stars per hour, and had discovered 200 new pairs. He had examined half of the stars in the AGK2 Catalog between + 20° and + 23° declination and planned to complete soon the zone between + 18° and + 25° declination. He expected the 76-cm refractor at Nice to be back in operation by the end of 1968, and planned to examine all the stars in the BD between declinations + 30° and + 42° with this instrument.

Couteau mentioned that among the pairs discovered in this manner, 4 to 5 percent already showed a perceptible motion after an interval of one year.

Luyten reported on the search for double stars from common proper motion among nearby stars. From the examination of a series of plates with the 48-inch Palomar Schmidt telescope, he had discovered about 1000 pairs where the components had common proper motions, with magnitudes brighter than 21. He expected to find 20000 such pairs from the complete survey.

Strand remarked that the parallax program at the U. S. Naval Observatory was indirectly a survey. 30 to 40 binaries with separations less than 1″.5 had been discovered in the program.

Worley remarked that in making his proposal of new surveys he had not thought of general surveys, but rather of systematic surveys of special objects.

The President said that it would be difficult for the Commission to determine without further deliberation what surveys should be undertaken. Moreover, they would depend almost entirely upon the choice of the individual observer.

As to the problem regarding the use of computers for large scale orbit computations, this problem had already been taken care of at the Hamburg General Assembly (*Trans. IAU.*, **XIIA**, 357, 1965), and no new case had occurred since.

The President, calling attention to the proposal by Arend and Dommanget in regard to modification of the definition of the orbital element as adopted by the Commission at the 1935 meeting, invited Dommanget to explain the problem. *Dommanget* said that the 1935 definition of the orbital element was in full accord with the one adopted in celestial mechanics, and also agreed with the usage in regard to spectroscopic orbits of always giving the semi-amplitude of the radial velocity curve with a positive sign.

The modification which was proposed applied only to the cases where it is not possible to determine which of the nodes is the ascending one, and where, in that case, the definition states that the ascending node should be chosen between 0° and 180°, with the double sign ± assigned to the inclination. This had led to the wrong impression by too many orbit computers, that it is permissible to use a negative value for the inclination.

In response to a request by the majority of members present to make a minimum amount of modifications to the 1935 definitions, *Dommanget* suggested that only that part dealing with the ambiguity of the position of the ascending node should be changed.

After rejection of a proposal to establish a working group to study the question further, the Commission agreed to modify the 1935 definition of the elements, as follows:

i Inclination at the ascending node. For direct motion in the first quadrant, for retrograde motion in the second.

Ω Position angle of the ascending node for equinox 1900.

ω Longitude of periastron. Angle in plane of true orbit, always counted in the direction of motion, from the node, as given, to periastron.

When data referring to the third coordinate are not available, one of the nodes is provisionally chosen as the ascending one. In each case computers should state in their publications whether the given node is the ascending node.

By publishing at the same time, as proposed by Arend and Dommanget, and agreed to by other members of the Commission, the Campbell and the Thiele-Innes elements, no doubt would exist in regard to the definitive or provisional character of the ascending node. The presence of the double sign for the elements C, H, pL, pN, showing the ambiguity of the position of the ascending node, the upper sign should correspond logically to the value published for Ω and ω, and the lower sign to the values obtained by the addition of 180° to each.

Muller requested that in the case where a publication gives both Campbell and Thiele-Innes elements, the author should indicate which series of elements were used in the computations.

A special meeting was held in regard to the working group proposed by Eggen of Commissions 26 and 42. It was concluded that a liaison between Commissions 26 and 30 would be more desirable.

Upon the conclusion of the business meeting, brief summaries were given by Batten and Dommanget on recent statistical investigations made by them.

Batten reported that he and Ovenden had investigated the distribution of the values of the longitude of periastron of orbits of spectroscopic binaries with reference to the well-known Barr Effect. They had used the visual binaries listed in Worley's Orbit Catalog as a control group and found, to their surprise, that the orbits in this catalog also appeared to have a non-random distribution of the longitudes of the periastron, in that for the primary orbits they seem to be more frequently between 0° and 180° than between 180° and 360°. The authors did not believe that the ambiguity in the node would produce such an effect, neither did they think that it was a selection effect.

Dommanget reported that at the completion of the catalog of radial velocity ephemerides for visual binaries with known orbits (*Obs. r. Belgique*, Série B, No. 15) a list of 70 binaries was established for which the position of the true orbital plan was well defined in space.

A statistical investigation in regard to the distribution of the poles of the planes of the orbits brought out two important results.

The first was the absence of poles in a region around the galactic coordinates $l^{II} = 35°$, $b^{II} = +60°$.

Having considered this point as the pole of a new galactic reference system, the Chi square test applied to the values of the new latitudes of the various orbital poles gave a probability of 0·3 percent, a value very significant of a non-random distribution.

A second result concerned the nine binaries nearest to the solar system. If one excludes α Centauri, the poles of their orbits group themselves quite close to the direction $l^{II} = 100°$ and $b^{II} = -15°$, while their space motion is more or less parallel to the direction $l^{II} = 5°$, $b^{II} = -10°$. It is realized that the two directions are nearly perpendicular to each other or that the average direction of the space motion is within 5° of the mean orbital plane.