THE VISUAL DOUBLE STAR CATALOGUES

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ABSTRACT

The historical development and current status of the two visual double star catalogues maintained at the Naval Observatory are discussed.

The Naval Observatory maintains two visual double star catalogues by international agreement. These catalogues are among the oldest continuously-updated data files in astronomy, having been established more than a century ago. The first of these catalogues, called the Index Catalogue, lists all known double and multiple stars; it currently contains 70,295 entries. The second catalogue is called the Observation Catalogue; it lists all observations of double stars published since 1927, plus a considerable number of earlier measures: entries total 301,995 as of 1976.5. Throughout their history these catalogues have exercised immense influence on the development of double star astronomy, while at the same time proving to be of great value to the general astronomical community. Their value has been enhanced because they always have been maintained by experts in the field, and because there has been periodic publication of the accumulated data.

S. W. Burnham began to collect double star data about 1870, and in 1906 he published A General Catalogue of Double Stars within 121° of the North Pole. This catalogue, usually abbreviated BDS, consists of two sections. The first is an index catalogue, which lists positions and other pertinent identifica-

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tion information for all double stars known in 1903. Entries total 13,665. The second, and much larger, portion of the catalogue gives a selected list of measures of each pair, plus references to all omitted measures, and also includes extensive notes on many stars.

The high rate of double star discovery and observation in the first decades of this century soon made Burnham's catalogue obsolete. Burnham himself continued the collection of new data until 1912, when Eric Doolittle assumed this duty, which he continued until his death in 1920. R. G. Aitken then began his long association with the catalogues, which did not end until after World War II. In 1932 Aitken published his New General Catalogue of Double Stars within 120° of the North Pole (ADS). This catalogue rejected about a third of the wide pairs listed by Burnham, yet nevertheless contained 17,180 double stars. Unlike the BDS, the ADS attempted to list all measures made of each object between 1903 and 1927; however, space limitations forced Aitken to combine individual measures into means in many instances.

Southern double stars were cared for by R. T. A. Innes, who produced a Reference Catalogue as early as 1899. His major catalogue, however, was the Southern Double Star Catalogue (SDS), published in loose-leaf form in 1926-27. This work also omitted wide pairs, but still contained nearly 10,000 objects.

Following the retirements of Aitken and Innes, H. M. Jeffers became responsible for the northern doubles, and W. H. van den Bos for those south of -20°. About twenty-five years ago the transfer of the northern data from hand-written cards to punch cards was begun, and, following the later decision to combine northern and southern catalogues, the southern material was also punched. A comprehensive, but not complete, catalogue of observations was thus formed for the first time, and from it the Index Catalogue of Visual Double Stars, 1961.0 (IDS) was constructed and published in 1963 by Jeffers, van den Bos, and Greeby. This catalogue included all the pairs omitted by Aitken and Innes, but gave no individual measures. Objects listed totalled 64,237. A serious defect, in my opinion, was the omission of a bibliography of the published measures, which formed such a helpful feature of the BDS and the ADS.

In 1964 the Naval Observatory assumed responsibility for the two catalogues. Since that time 6,048 double stars have been added to the Index Catalogue, while the Observation Catalogue has grown by 93,123 cards. For some time now a project has been underway to complete the Observation Catalogue by the addition of all of the pre-1927 measures. Of the total of 301,995 cards now filed in this catalogue, 46,085 represent these

older observations. Another 30,000 cards are in preparation. My best estimate is that the older material will not substantially exceed 150,000 cards, so that roughly half of this project is finished.

Responsibility for the catalogues also extends to error detection and correction. About 10,000 corrections have been incorporated in the last eleven years. Many of these corrections, however, represent only minor alterations of format designed to increase the homogeneity of the data. The Naval Observatory has also agreed to supply three depositories with exact copies of all additions and alterations to the catalogues. The three depositories are currently at the Lick, Nice, and Royal Greenwich Observatories, to which card shipments are made on an annual basis.

Users of visual double star data fall rather naturally into two groups. The non-specialist usually is interested in knowing if certain stars in an observation list or catalogue are double; and, if so whether or not the pairs are physical. Consequently, we often receive requests for data on large numbers of stars from such users. On the other hand, the specialist usually wants extensive data on relatively few objects, and thus it is generally possible to serve his needs more quickly. To date, about 250 data requests have been filled, excluding telephone inquiries and our own extensive internal use of this material. Requests have ranged from data on a single star to more than 6,000 objects. The entire Index Catalogue has been requested and supplied on tape perhaps a dozen times. Full documentation is included with each tape, and with the listings we provide a complete description of coded data plus an explicit reference to the publication in which the data originally appeared. Small quantities of data are supplied free, but for extensive requests we ask for compensation in the form of blank cards or tapes.

The major problem we have experienced with users of the double star data is that of the form of their request. Since the catalogues are ordered by 1900 coordinates, we must have this information in order to remove the desired data from the catalogue. Because of staff limitations, we find it impossible to accommodate users who send requests using epochs other than 1900, or other identifications, unless their request happens to be for a dozen objects or less. In the case of tape users, we are able to supply either 7 or 9-track, with a number of choices of recording density.

In conclusion, experience makes it evident that availability of the double star catalogues in machine-readable form fills a wide and growing need in the astronomical community. Comple-

tion of the data file through inclusion of the older material, plus the continuing correction and homogenization process, give these catalogues steadily increasing value. While the creation and maintenance of catalogues is hard and unexciting work, the history of our science amply demonstrates the permanent value of such endeavors.

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