

COMMISSION 26: DOUBLE AND MULTIPLE STARS (USNO contribution)

PRESIDENT: C. Allen
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1. Meetings

1.1. *IAU Symposium 240*

The largest meeting in the history of our Commission was held during the Prague General Assembly in August 2006. Symposium 240, *Binary Stars as Critical Tools and Tests in Modern Astrophysics*, was jointly sponsored by Commissions 26 and 42 with support from 11 other commissions and working groups. The 3.5-day meeting was attended by some 500 astronomers from 54 countries and included talks covering all aspects of binary and multiple star research: from very long period, common proper motion pairs and other “fragile” binaries to short-period contact binaries, binaries with degenerate components, as well as star/brown-dwarf/planet systems, with the aim of exploring interests common to all binary star researchers. Both the observational and theoretical aspects of binary and multiple star research were represented, but the main themes of the program were the new information and physical insights gleaned from the recent advances in instrumentation and techniques. The meeting also attracted those interested in the observational and theoretical aspects of modern stellar astrophysics that depend very strongly on the fundamental properties of stars found primarily from binary and multiple stars.

The format for the symposium was a mix of invited oral review presentations and more narrowly-focused topical presentations. These 40 invited talks were supplemented by over twenty short oral/poster presentations, selected by the SOC from over 180 submitted posters.

As the first major joint meeting in modern memory of the “close” and “wide” binary communities, it was deemed appropriate to dedicate the meeting in honor of Mirek J. Plavec† and in memory of Charles E. Worley. Also remembered at the meeting was Wulff D. Heintz, who had died two months earlier.

Proceedings of the meeting were edited by William Hartkopf, Petr Harmanec, and Ed Guinan, and published by Cambridge University Press in 2007. A companion website at Cambridge Press includes 115 complete posters from the meeting, as well as all talks and poster abstracts in the book.

2. Catalogues and Journals

The U.S. Naval Observatory double star program maintains five astrometric and photometric catalogs, each of which has seen considerable growth during the past three years. These five catalogs are updated regularly on the USNO website.

† Professor Plavec, who attended the meeting with his family, unfortunately passed away at his home on January 23, 2008.

The *Washington Double Star Catalog* is the principal repository for all published astrometry of visual binary and multiple stars. As of 30 June 2008 the WDS contained 748,343 mean measures of 103,812 systems. The database continues to be improved through correction of errors, removal of duplicate discovery designations and/or measures, and improvements in coordinate, proper motion, and magnitude information. Observing lists based on the WDS are provided on demand for other observers.

As of 30 June 2008, the *Sixth Catalog of Orbits of Visual Binary Stars*, included 2,088 orbits of 1,956 systems, from a “master file” of 6,028 orbits.

The *Fourth Catalog of Interferometric Measurements of Binary Stars* currently includes 143,903 observations of 73,275 systems. Binary measurements from speckle interferometry, adaptive optics, multi-aperture arrays, Hipparcos, and other high-resolution techniques are included, as are negative results from duplicity surveys made using these techniques.

The *Third Photometric Magnitude Difference Catalog* includes 158,946 measures of 52,752 systems. This is somewhat reduced in size from the previous version of the catalog, as it was deemed unnecessary to duplicate photometric information also in the main WDS database.

The *Catalog of Rectilinear Elements* was posted to the web during the past triennium; the catalog currently includes elements for 1,170 (presumably) optical pairs, although this number is expected to increase substantially. Studies have shown that these linear fits often yield more precise differential proper motions than are available elsewhere, due to the long time base of differential astrometry measures available in the WDS database.

The second USNO Double Star CD, containing versions of all five catalogs as of 2006.5, was published just before the Prague GA and distributed to those in attendance as well as all members of the Commission. Additional copies are available upon request.

The *Journal of Double Star Observations*, a quarterly publication begun in early 2005 by astronomers at the University of South Alabama, has seen considerable growth during the past triennium. This web-based refereed journal now represents a major source of published measures and other double star information by both professionals and amateurs. Other venues for publication of double star information, including the *Webb Society Circulars* and *Observations et Travaux*, also illustrate the high level (and quality) of activity in our field within the amateur observing community.

3. Speckle interferometry and other single-aperture high-resolution astrometry techniques

The speckle interferometry program also continues at the USNO. Most observations have been carried out on the venerable USNO 26-inch refractor, with $\sim 4,300$ mean measures published or in press since mid-2005 (c.f., Mason et al. 2006a, 2006b, 2007). Much of this observing effort has been directed toward duplicity confirmations and observations of systems not measured for many years, as well as regular monitoring of potential orbit systems. A new “backup” speckle camera was designed and built at the USNO and installed on the 26-inch in mid-2006; this allows use of the “primary” camera at larger telescopes with less frequent shipping and no observing time lost due to equipment in transit.

The “primary” speckle camera was used on several larger telescopes during the past triennium, including the KPNO and CTIO 4-meters and the Mount Wilson 2.5-meter. Over 3,000 nearby G dwarf stars were examined for duplicity during this period, as were

a similar number of massive (O, B, and Wolf-Rayet) stars. Results from these analyses are being prepared for publication.

Adaptive optics on the 3.6-meter AEOS telescope on Haleakala, Hawaii has been used in searches for faint companions to B stars (Roberts et al. 2007) and O stars (Turner et al. 2008), as well as possible stellar companions to exoplanet host stars (Roberts et al., in preparation).

References

- Mason, B.D. et al. 2006a, *AJ*, 131,2687
- Mason, B.D. et al. 2006b, *AJ*, 132, 2219
- Mason, B.D. et al. 2007, *AJ*, 134, 1671
- Roberts, L.C.. et al. 2007, *AJ*, 133, 545
- Turner, N.H. et al. 2008, *AJ*, in press