Wesleyan University
Astrometric-Photometric Group
Middletown, Connecticut 06459

[S0002-7537(90)03301-7]

1. INTRODUCTION

The following report covers the activities of the Astrometric-Photometric Group for the year ending 31 August 1999.

The Astrometric-Photometric Group (APG) came into being in 1997 as a group of astronomers actively pursuing stellar research in a number of closely related fields. Its office is located at 349 Science Center, Wesleyan University, Middletown, CT 06459, email: apg@mail.wesleyan.edu, phone: (860) 685-3678, fax: (860) 685-3992. Details about its formation and purpose can be found in its first annual report, published in *B.A.A.S.* for 1997.

2. PERSONNEL AND TEACHING

We note with sadness the passing of Prof. Heinrich K. Eichhorn in April, 1999 after a long illness. Dr. Eichhorn was professor of astronomy and observatory director here, until becoming chair of the Astronomy Department at the University of Florida in 1964. He was a close colleague of several of the APG for many years.

The APG staff includes Arthur Upgren, John M. Van Vleck Professor of Astronomy; Research Fellows A.G. Davis Philip and Jurgen Stock; Research Associates John T. Lee and Edward Weis; and Research Assistant, John W. Griese, III.

The astrometric program using the 0.5m Van Vleck refractor came to a natural end in July, 1999. It was decided not to continue the program using CCD capability, though that would be feasible to use with this instrument.

This ends 77 years of astrometric observations with the telescope. The program was started by F. Slocum and C. Stearns with first observations made in 1922. Although interrupted for a short period by the Second World War, and again upon the retirement of Stearns, it resumed in 1960 under the direction of Eichhorn and again under Upgren's supervision in 1967. More than 700 parallaxes were determined, the most recent were for stars of intermediate metallicity, most of which are too faint to be observed by the Hipparcos program. Measuring and reduction of them will be continued to the extent possible.

Research Associate Weis continued and completed the observing portion of the program, gathering photographic plate material for the last stars remaining on the parallax observation program. He retired in summer 1999, but continues to be active in astronomical research. He published a paper of photometry of stars with discordant parallaxes from different methods in the CNS3 Catalogue.

Upgren continues as Senior Research Scientist at the Department of Astronomy at Yale University, and as one of the Board of Directors of the International Dark-Sky Association (IDA). He continues to write and advise on a number of outdoor lighting issues as Connecticut State Chair of the New England Light Pollution Advisory Group (NELPAG) and as vice president and trustee of the Fund for Astrophysical Research, Inc. and chair of its Theodore Dunham Jr. Grant Program Committee. He is a member of the Advisory Committee of the Shapley lectureship program of the AAS, and Associate Editor of the ISO Contribution Series (formerly the Contributions of the Van Vleck Observatory).

Philip continues as Director of the Shapley Visiting Lectureships Program and as Co-editor of Baltic Astronomy. A Web page for the Shapley Visiting Lectureships Program was set up by Philip and Institute for Space Observations (ISO) Research Consultant Rebecca Koopmann. Philip continues as a trustee of the Fund for Astrophysical Research and serves on its Theodore Dunham, Jr. Grant Program Committee. He is Secretary and Treasurer of the New York Astronomical Corporation. and President of the ISO, as well as Research Professor at Union College. This fall he was inducted into the Lithuanian Academy of Sciences while at Vilnius.

Stock continues as vice president and astronomer at CIDA, the Venezuelan National Observatory at Mérida, which he established and directed for a number of years. He is active in the observing program using CCD frames on the 1.5m CIDA Schmidt telescope for drift scans and other projects. He is advising Ph.D. students Javier Garcia, Angel Muñoz, and M. Jeanette Stock, all of the Universidad de Zulia in Maracaibo, as well as for Eduardo Miranda and Julian Suarez, who are working toward a Master's degree at the Universidad de los Andes, in Mérida.

In the spring and again in the autumn of 1999, Upgren again taught his course on the history of astronomy with the teaching assistance of Griese. Upgren and Griese again shared a course in the summer phase of the Graduate Liberal Studies Program. Griese continued teaching basic astronomy during the fall semester of 1998 and again in 1999 as an adjunct instructor at Middlesex Community Technical College. During the spring 1998 semester he taught in Stamford, West Hartford, Glastonbury, Berlin and Willimantic. He continues to host the visitor's nights at Stamford Observatory and conduct variable star research there for the AAVSO. He is currently vice president of the Fairfield County Astronomical Society, which operates the observatory.

Upgren and Stock are completing a book dealing with weather and climate and featuring El Niño and the global warming problem. Publication is planned for mid-2000 by Perseus Press. Upgren's first book, ''Night has a Thousand Eyes,'' is to appear in paperback form this year.

A number of other volumes have also been published. Philip, Upgren, and W. van Altena as editors, completed the proceedings of a meeting held at Yale and honoring the 90^{th} birthday of Dorrit Hoffleit. These have been published and copies are being sent to participants from Yale University.

The proceedings of The Third Conference on Faint Blue Stars, held at Union College in October of 1996, have been published and mailed out to participants. The proceedings of the Joint Discussion, ''Electronic Publishing: Now and the Future,'' held at the Twenty-third General Assembly of the IAU, in Kyoto, Japan in August, 1997, edited by Peter Boyce and Philip have also been published, in the *Transactions of the IAU* . The proceedings of the meeting, The Kth Reunion, held at Case Western Reserve University, in May, 1998, is in the process of editing.

3. RESEARCH

The twentieth list of observations and reductions for parallaxes and proper motions of 48 stars in 14 parallax fields by Weis, Upgren, Griese, Lee, A. H. Lee, and Vincent in the Astronomical Journal. The list includes five resolved binaries or triple stars and four white dwarf members of the Hyades cluster. At magnitudes of about 14, the white dwarfs are the faintest stars ever observed for parallax with this refractor. Reductions of the measures have revealed several stars with significant parallaxes or proper motions among those measured for the reference frames.

Lee and Upgren have nearly completed a study of the kinematics of the open cluster IC 4756. This is one of the three open clusters designated a parallax standard field by IAU Commission 24; the others are Praesepe and the Pleiades. About a third of the 104 plates have been measured with the Yale PDS Microdensitometer by summer assistant Kelsey Jackson. All plates were taken with the Van Vleck refractor and the 34-year time spread is sufficient to determine the field proper motion differences of the stars from the PDS measures to be about 0″.0008/yr, and the mean proper motion of member stars is about 0″.003/yr with respect to the mean of those for the field stars. This indicates that the epoch difference offers an adequate base line in time for sufficiently accurate measures of the internal motions of the member stars. This cluster has also been observed with the 1.5m astrometric reflector of the U.S. Naval Observatory and the 0.65m McCormick Observatory refractor, material that may also become available for the motion study.

Lee continues his program of HYDRA observations of the spectra and colors to supplement the Wesleyan and Yale astrometric programs. They are being continued using the WIYN telescope at Kitt Peak. A total of about 500 stars brighter than the 16th magnitude are on the WIYN HYDRA program, in order to obtain spectra of intermediate resolution of the stars of this brightness in the field of IC 4756. With an expected radial velocity precision of $\pm$ 4 km/sec, accurate space velocities of the cluster members are anticipated. Observations will continue until all stars of interest have been covered.

The Straizys (ITPA, Lithuania), and R. Boyle (Vatican Observatory Group) are collaborating with Philip in a program setting up the new Strömvil system (a combination of filters from the Vilnius and Stromgren photometric systems). Philip and Boyle have been making Strömvil observations of stars in open and globular clusters with the Vatican Advanced Technology Telescope on Mt. Graham, Arizona. These observations are most advanced in the globular clusters M 3, M 5 and M 92. The open cluster M 67 is set up as a standard region. Philip is continuing his reduction of 4-color photometric CCD data at DAO. Reports have been made of a group of underluminous stars found below the horizontal branch of the globular cluster M 92. Reductions of these data obtained with the VATT of the globular cluster M 5 show that this cluster exhibits the same feature. Philip gave a paper on M 92 at the Third Stromlo Symposium in Canberra in August, 1998 and attended IAU Symposium No. 192 in Cape Town in September. Philip and Boyle contributed a paper at the Workshop on Strömvil Photometry held at Vilnius in fall 1999.

Stock and M.J. Stock have obtained equivalent widths of 19 absorption lines in CCD slit spectra of 487 stars with B-V colors, absolute magnitudes derived from Hipparcos parallaxes, and metallicity indices. The stellar sample is distributed throughout the HR diagram and is restricted to stars whose parallax error as given by Hipparcos is less than 20 per cent of the size of the parallax, itself.

Algorithms are found which yield absolute magnitudes for all spectral types with an average error of 0.26 magnitudes. The B-V colors can be reproduced with an average error of 0.018 magnitudes for early type stars, and 0.020 magnitudes for the late type stars. The metallicity is recovered with an average error of 0.06 dex and 0.07 dex for the early and late type stars, respectively. The data are to be further examined using various weighting schemes for the errors. These results reveal a greater precision in the determination of basic stellar parameters from spectral classification, than do the more traditional systems of classification such as the MK and Mount Wilson systems. These results are in press in *Revista Mexicana*.

4. PUBLICATIONS

Boyce, P. B. & Philip, A. G. D. 1998, Electronic Publishing of the Future, Transactions of the IAU XIIA, J. Andersen, ed., Kluwer Acad. Publishers, 595, 117, 181

Lee, J. T. 1999, ''Star Atlas of Dzewueyhuan,'' Anni Mirabiles, A Symposium Celebrating the 90^{th} Birthday of Dorrit Hoffleit, 39

Philip, A. G. D., W. F. van Altena & A. R. Upgren, eds. 1999, Anni Mirabiles: A Symposium Celebrating the 90^{th} Birthday of Dorrit Hoffleit, L. Davis Press, Schenectady

Philip, A. G. D. 1999 ''The Shapley Visiting Lectureships Program - 1997'' in Anni Mirabiles: A Symposium Celebrating the 90^{th} Birthday of Dorrit Hoffleit, A. G. D. Philip, W. F. van Altena & A. R. Upgren, eds., L. Davis Press, 107

Philip, A. G. D. 1999, ''The Stars Below the Horizontal Branch in the Globular Cluster M 92,'' in the Third Stromlo Symposium - The Galactic Halo, B. K. Gibson, T. S. Axelrod & M. E. Putman, eds., ASP Conf. Series 165, 321

Stock, J. & Molina, R. 1998, ''A Method of Numerical Integration for Calculating Astronomical Refraction,'' Revista Mexicana 34, 79

Stock, J. and Stock, M.J. 1998, ''Quantitative Stellar Spectral Classification,'' in Proceedings of the IAU Regional

Meeting, Puebla, Mexico, November 1998, Revista Mexicana

Stock, J., Upgren, A. R. & Lee, J. T. 1999, ''Test of a New Image Centering Algorithm,'' Anni Mirabiles, A Symposium Celebrating the 90^{th} Birthday of Dorrit Hoffleit, 137

Upgren, A. R. 1999, ''Willem Jacob Luyten 1899-1994, A Biographical Memoir,'' National Academy of Sciences, Biographical Memoirs, Vol 76, 3

Upgren, A. R. 1998, ''Parallax (Astronomy)'' , McGraw-Hill Encyclopedia of Science and Technology, 9^{th} Edition, Publ. McGraw-Hill, New York, 93

Upgren, A.R. and Hemenway, P.D. 1999, ''Hipparcos and other Data for A and F Stars,'' The Third Conference on Faint Blue Stars, ed. A. G. D. Philip, J. W. Liebert, & R. A. Saffer, 385

Upgren, A. R. 1998, ''Light Pollution: From Confrontation to Cooperation,'' International Association of Photoelectric and Photographic Photometry Communications No. 72, 75

Upgren, A. R. 1999, ''The End of Orion,'' Mercury, Vol. 28, No. 3, 30

Upgren, A. R., Aller, L. H., Philip, A. G. D. & Dunham, W. B. Jr. 1999, ''The Fund for Astrophysical Research: Twelve Years of the Small Grants Program,'' BAAS, 30, 1159

Upgren, A. R., Hemenway, P. D. & Lee, J. T. 1999, ''Hipparcos parallaxes and the Concentration of the Giant Branch,'' Anni Mirabiles, A Symposium Celebrating the 90^{th} Birthday of Dorrit Hoffleit, 113

Weis, E. W., Lee, J. T., Lee, A. H., Griese, J. W. III. Vincent, J. M., and Upgren, A. R. 1999, ''Parallaxes and Proper Motions. XX,'' AJ, 117, 1037

Weis, E. W., ''Photometry of Late Dwarf Stars,'' 1999, AJ, 117, 3021

Arthur R. Upgren

♦