

Acknowledgements

This work would not have been possible without the knowledgeable guidance of my adviser, P. Ianna, who is a national treasure of astrometry. Not only was he willing to take on a non-traditional graduate student but he continued with this project long after his retirement. I am forever grateful for his guidance and encouragement.

My family supported this work through their individual efforts, through their emotional support of me, and through their financial generosity. My grandfather, G. Dormann, gave me a telescope when I was in grade school because he believed I would be an astronomer. My parents created me and encouraged me in every way. Without the technical support of my father, the original J. L. Bartlett, this document would not have come to fruition. My husband, K. Riggleman, agreed to help me study fuzzy dots and has kept that promise for six years of married life. I also appreciate the teasing and good-natured questioning of this project by my mother and my brother. My in-laws have been remarkably tolerant of the demands this work placed on family life. I love each of you very much.

R. Rood encouraged me to pursue astronomy when I visited the University of Virginia (UVa) as a junior high school student. Then, he supported my application to enter UVa as a part-time graduate student. Finally, he evaluated this work. I am grateful for his faith in me.

When P. Ianna was unavailable, R. J. Patterson and L. Fredrick tried to answer my questions. Their knowledge of astrometry and the parallax programs at Leander

McCormick Observatory and Siding Spring Observatory contributed to the planet searches described therein. R. J. Patterson also undertook to teach me photometry.

M. Begam, who developed the data reduction pipeline for the Southern Parallax Program (SPP), made the initial calculations of parallaxes and proper motions on which the work in Chapter 3 is based. He generously provided assistance throughout the analysis of these stellar motions and during the adaption of the SPP data reduction pipeline for use with 31-inch (0.8-meter) Fan Mountain Observatory (FMO) telescope. In addition, he patiently taught me to observe with the 26.25-inch Leander McCormick Observatory telescope.

T. Henry generously accepted the subsample described in Chapter 4 for inclusion in the Cerro Tololo Inter-American Observatory (CTIO) Parallax Investigation (CTIOPI). The RECONS Team, especially T. Henry, W.-C. Jao, J. Subasavage, T. Beaulieu, and J. Winters, obtained essential observations and supplied indispensable data reduction assistance. CTIOPI would not be possible without the excellent support provided by the CTIO staff, including A. Miranda, E. Cosgrove, and A. Gomez. I look forward to continuing to work with them on this project. CTIOPI was a National Optical Astronomy Observatory (NOAO) Survey Program and continues as part of the Small and Moderate Aperture Telescope Research System (SMARTS) Consortium.

M. Skrutskie was generous in making observing time on and archival observations from the 31-inch FMO telescope available. C. Park and S. Kanneganti were most helpful throughout the observations, data reduction, and analysis. I hope that

their efforts will lead to a revitalization of Fan Mountain Observatory, including astrometric work.

Not only did D. M. Whittle and W. T. Joyner serve on my dissertation committee, but they provided invaluable personal encouragement and support throughout this work. D. M. Whittle ensured that I navigated all the necessary preliminary requirements and helped shape the final document. W. T. Joyner ensured that I survived my first full-year teaching at Hampden-Sydney College.

G. F. Benedict graciously agreed to serve on my dissertation committee. Before that he also gave impetus to this work when he assured me that the early periodograms for Barnard's Star looked just like his.

C. Summers generously assisted with the identification and location of essential research materials. The Astronomy Library is fortunate to have her.

V. Bossong, B. Johnson, and J. Harding kept the Astronomy Department running throughout the time of this project. Their administrative support was essential in so many ways that most of us are not aware. C. Wienstein, K. Xiluri, and H. Powell provided the computing resources and support necessary to all of the functions of the Astronomy Department. We should all say thank you to these critical support people more often than we do.

This research made use of

- National Aeronautics and Space Administration's (NASA's) Astrophysics Data System (ADS);
- Vizier (Ochsenbein, Bauer, & Marcout 2000);

- Set of Identifications, Measurements, and Bibliography for Astronomical Data (SIMBAD) database, operated at Centre de Données astronomiques de Strasbourg (CDS), Strasbourg, France;
- data products from 2MASS, which is a joint project of the University of Massachusetts and the Infrared Processing and Analysis Center/California Institute of Technology (CIT), funded by the NASA and the National Science Foundation (NSF);
- Aladin;
- WEBDA database, operated at the Institute for Astronomy of the University of Vienna; and
- M, L, and T dwarf compendium housed at DwarfArchives.org and maintained by C. Gelino, D. Kirkpatrick, and A. Burgasser.

I also acknowledge the data analysis facilities provided by the Starlink Project, which is run by the Council for the Central Laboratory of the Research Councils (CCLRC) on behalf of the Particle Physics and Astronomy Research Council (PPARC).

This research made use of Second Generation Digital Sky Survey images (McLean *et al.* 2000; hereafter DSS2) and first epoch Digital Sky Survey images (DSS) that were obtained by the Anglo-Australian Observatory (AAO) with the United Kingdom (UK) Schmidt Telescope. The Space Telescope Science Institute (STScI) digitized and compressed images under United States (US) Government grant NAG W-2166. The AAO Board retains the copyright to the DSS2 images. The UK Science and

Engineering Research Council/PPARC (SERC/PPARC), and the Anglo-Australian Telescope Board jointly hold the copyright to the DSS images. The UK Schmidt Telescope was operated by the Royal Observatory Edinburgh (ROE) with funding from the UK SERC (later UK PPARC), until 1988 June, and thereafter by the AAO. In addition, the authoress acknowledges the use of NASA's *SkyView* (McGlynn, Scollick, & White 1996²³) facility located at NASA Goddard Space Flight Center.

This research also uses photographic data obtained using Oschin Schmidt Telescope on Palomar Mountain. The Palomar Observatory Sky Survey was funded by the National Geographic Society. The Oschin Schmidt Telescope is operated by the CIT and Palomar Observatory, who hold the copyright to these images. The plates were processed into the present compressed digital format with their permission. The DSS was produced at the STScI under US Government grant NAG W-2166.

The research was funded by

- NSF grants AST 98-20711 and AST 05-07711;
- Space Interferometry Mission (SIM);
- Georgia State University;
- Litton Marine Systems, Incorporated;
- Governor's Fellowship of the University of Virginia (UVa);
- Hampden-Sydney College; and
- F. H. Levinson Fund of the Peninsula Community Foundation.

First and last, I praise God for creating the stars and me.

²³*SkyView* may be accessed at <http://skyview.gsfc.nasa.gov>