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This report covers the period 1 July 1993 through 30 June 1996.

1. PERSONNEL

W. D. Heintz and J. E. Gaustad continue as Professors of Astronomy. Rhodri Evans served as Visiting Assistant Professor in 1993/94 while Gaustad was on leave in Norway at the University of Trondheim. Heintz was assisted in completing the photographic astrometry program by B. A. Cantor (Widener University). Gaustad was assisted in his research by several undergraduate students during this period, including Eun Oh, Gang Chen, Charles Danforth, Nat Farny, Brett Schneider, Farahnaz Khosrowshahi, Lynne Raschke, and Yuhki Tajima. Under an exchange program supported by a grant from the Keck Foundation, several Swarthmore students worked at other institutions: Charles Danforth at Middlebury College (1993), Peter Sollins at Wellesley College (1994), Erik Rosolowsky at Wellesley College (1995), Alison Schirmer at Colgate University (1996). In addition Oh worked at Goddard Space flight Center in 1994, Chen at University of Georgia (1994), Rosolowsky at the University of Virginia (1996), and Sollins at Haystack Observatory (1996).

2. INSTRUMENTATION

The Sproul 61-cm refractor continues to be used by W. D. Heintz for double-star observations with a visual micrometer. The two-coordinate measuring machine, previously used in the photographic astrometry program, has been donated to a spectroscopic laboratory in Michigan. The 61-cm reflector drive system was completely rebuilt by DFM Engineering in 1993/94. A robotic CCD-camera, intended for wide-angle $H\alpha$ imaging of the interstellar medium, is under development in cooperation with Wayne Rosing of The Remote Telescope Company, Inc.

3. RESEARCH

The program of photographic astrometry, in recent years under the direction of W. D. Heintz, was completed in the spring of 1994. It had extended over 82 years and yielded 1400 stellar parallaxes, over 100 mass ratios of binary stars, and the discovery of some unresolved red-dwarf binaries. The 61-cm refractor is currently used with the visual micrometer only. Over 3100 double-star measurements and over 100 revised or new orbits, including some multiple systems, have been obtained. Examination of stars for duplicities in some sky zones continued until 1995. Heintz completed the revision and publication of a three-volume "Compendium of Practical Astronomy" in 1994. Using a wide-angle CCD camera with a narrow-band $H\alpha$ filter, Gaustad and collaborators have been able to set an upper limit on the contribution of Galactic free-free emission to the anisotropy in the cosmic microwave background near the

North Celestial Pole of 7% at degree angular scales. A robotic camera system is under development which will be used to survey the entire southern hemisphere sky at $H\alpha$ to a brightness level of 1 Rayleigh at 0.1 degree resolution for the purpose of studying the structure of the interstellar medium as well as setting further limits on the Galactic contribution to the microwave background. In his senior thesis (1995) Charles Danforth used the high-dispersion spectrograph on the 61-cm reflecting telescope to study the time variations in the $H\alpha$ emission line of Rigel (β Ori), a B- supergiant with a stellar wind. He found that the line profile can change from night to night, sometimes disappearing altogether. He obtained enough observations over the year to suggest that there may be a periodicity of about 32 days in the emission line strength.

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