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1. INTRODUCTION

This report describes research performed from September 2000 through September 2001 by astronomers at the Computer Sciences Corporation (CSC).

Research in astronomy at CSC is primarily performed by members of Science Programs, part of the Civil Group in CSC's Federal Sector. Dr. C. Wu is the Director of Science Programs. Science Programs staff members provide Hubble Space Telescope (HST) operations support and Multimission Archive at Space Telescope (MAST) support at the Space Telescope Science Institute (STScI), science support to NASA's Goddard Space Flight Center (GSFC) and Johns Hopkins University (JHU) Department of Physics and Astronomy Far Ultraviolet Spectroscopic Explorer (FUSE) Project. In addition to their support work, CSC astronomers are active in a wide range of research activities supported by NASA contracts.

Astronomers and research assistants at CSC during this reporting period were D. Adler, V. Airapetian, T. Ake, M. Allen, S. Anderson, R. Arquilla, W. Baggett, J. Baum, J. Bedke, M. Bielefeld, J. Caplinger, D. Chance, G. Chapman, K. Clark, T. Ellis, M. England, L. Evans, D. Fraquelli, E. Giovane, A. Groebner, F. Hamilton, H. Hart, W. Hathaway, A. Holm, C. Imhoff, D. Jones, I. Jordan, D. Kaufmann, D. Kenny, W. Kinzel, M. Kochte, V. Laidler, H. Lanning, C. Loomis, O. Lupie, D. MacConnell, L. Marochnik, R. McCutcheon, G. Menchaca, J. Mo, R. Parise, S. Parsons, A. Patterson, P. Pitts, R. Pitts, C. Proffitt, M. Reinhart, M. Robinson, R. Robinson, J. Rose, W. Rumpl, F. Schiffer, A. Schultz, K. Scollick, J. Scott, D. Smith, M. Smith, C. Sturch, D. Taylor, T. Teays, R. Thompson, B. Turnrose, T. Walker, E. Wells, A. Welty, C. Wu, J. Younger, and D. Zak.

2. RESEARCH

2.1 Stellar Astronomy and Astrophysics

Imhoff, with G. Herbig (Hawaii), C. Aspin (Gemini Obs), A. C. Gilmore (Canterbury), and A. F. Jones (New Zealand), performed a study of the outburst activity of the T Tauri star EX Lupi. Optical photometric and optical, infrared, and ultraviolet spectroscopic observations from the star's outburst in 1993-94 were combined to describe the characteristics of the outburst. The evidence suggests that a magnetospheric accretion event is responsible for the outburst.

Lanning, with M. Meakes (STScI), continues his analysis of the Sandage Two-color (U,B) Survey of the Galactic Plane. Plates taken with the 48-inch Oschin Schmidt telescope at Palomar Observatory are being scanned to identify objects bright in the UV, often including white dwarf candidates, CVs, B shell stars, etc. The sixth in the continuing series of catalogs of UV-bright sources is in press, bringing the total number of published UV sources to 572. Work has begun on the seventh catalog. This project has been supported by a three year NASA ADP grant which has been instrumental in providing substantial progress on the survey analysis. Detailed information related to this project (including published works, tables, and finding charts) is available on the WWW site devoted to the survey at http://www.stsci.edu/~lanning/index.html.

Lanning participated with M. Eracleous and R. Wade (Penn State) in undertaking a spectroscopic reconnaissance of a selected sample of the Lanning UV sources. Low-resolution spectra of the sources were obtained using the Hobby-Eberly 9-m telescope at the McDonald Observatory and the Kitt Peak 2.1-m telescope. Several new DA white dwarfs were identified as well as a number of sources exhibiting very interesting features characteristic of low-luminosity objects.

MacConnell continued analysis of near-IR objective-prism plates from CTIO determining accurate coordinates and providing charts for 759 cool carbon stars. Of these, 164 newly identified stars were incorporated into the third edition of the ''General Catalog of Galactic Carbon Stars'' (A. Alksnis et al., Baltic Astronomy Vol. 10, Nos. 1/2, 2001).

MacConnell continues a collaboration with R.F. Wing (Ohio State) and E. Costa (U. Chile) to search for distant, cool supergiants as spiral arm tracers. Slit spectra of over 800 candidates have been classified, and reductions of 8-color, narrow-band photometry of 1560 candidates are underway. About 250 supergiants have been identified including some at large distance and others of peculiar spectra and colors.

Parsons continued work toward deriving the absolute magnitudes of 134 evolved late-type stars which have upper main-sequence secondaries with IUE spectra. Recent effort has seen the incorporation of more photometric data in order to improve the constraints on the SED analysis for relative luminosities of the binary components, especially from the Univ. of Lausanne General Catalogue of Photometric Data, the 2MASS catalog, and the Tycho experiment's individual B and V magnitudes for some component stars. Available constraints indicate that several systems considered to be double have at least three stellar components.

Parsons, with O. Franz and L. Wasserman (Lowell Obs), continued work on the mass of the G4 II star HD 173764 observed with HST's FGS3 in TRANS/POS modes. GaussFit solutions of the POS measurements at 8 epochs indicate orbital reflex motion of the primary at the level of 5 mas, consistent with and potentially much more precise than the Hipparcos parallax, proper motion, and orbit fit for the primary. Colors of the reference stars are being obtained in order to reduce uncertainties in the solutions due to the FGS lateral color corrections.

Proffitt, in collaboration with C. J. Sansonetti and J. Reader (NIST), has examined the Pb IV, Sn IV, and Ge IV resonance lines seen in archival HST spectra of an early-B star in the Small Magellanic Cloud, finding that this metal poor star has a nearly solar lead abundance. Such a large lead

abundance provides important support for recent theoretical models of the s-process in metal poor stars which predict large neutron exposures and large lead production in AGB stars with [Fe/H] near -1.

Proffitt, with S. Adelman (Citadel), G. J. Peters (USC), and G. Wahlgren (Lund), continues work using coadded IUE spectra to study very heavy elements in normal and chemically peculiar B stars. Improved techniques for the coaddition of IUE high dispersion spectra have been developed, as have procedures for generating detailed spectral atlases of the best observed narrow lined stars. The lines of Ga III, Pb IV, Sn IV, and Ge IV are clearly visible in the coadded spectra of several narrow-lined early-B stars and the utility of these lines for future astrophysical studies is being evaluated.

Proffitt, in collaboration with T. Brage (Lund), F. Rogers, and C. Iglesias (LLNL), continues theoretical work on the radiative acceleration of heavy elements in stellar envelopes and atmospheres. New frequency resolved opacities for stellar interiors have been calculated using a 10X finer grid than has been used in previous calculations. The effects of this finer mesh on radiative acceleration calculations in stellar envelopes are being evaluated. Improved techniques for radiative acceleration calculations in stellar atmospheres are also being developed, and large scale model atoms of gallium and other very heavy elements are being implemented for use in non-LTE calculations.

2.2 Extragalactic Astronomy

D. Smith collaborated with D. Calzetti, J. Harris, C. Conselice (STScI), and J. Gallagher (Wisconsin) in a study of the nearby starburst galaxy M83. This group used HST WFPC2 images to estimate the age and mass of 45 clusters in the nucleus of M83. A significant population of clusters lies in a narrow age range of 5 to 7 Myr. The group is pursuing a study of additional starbursts systems to determine if starburst events are synchronized or propagate through the host galaxy. D. Smith is currently investigating the cluster population in NGC 2903.

2.3 Education and Outreach

Teays serves as the Director of NASA's Origins Education Forum, and D. Smith as the Forum Scientist. In this capacity, Teays serves on the NASA Office of Space Science (OSS) Education/Outreach Advisory Council. The Origins Forum operates the Space Science Education Resource Directory (SSERD), a user-friendly search engine tailored for educators, on behalf of NASA. This year the SSERD team was awarded a NASA Group Achievement award for developing the Directory. The Origins Forum supported NASA at several major education meetings, including the National Science Teachers Association (NSTA), National Council of Teachers of Mathematics, the International Technology Education Association, and American Astronomical Society. They also worked in partnership with the NSTA to present a two-day workshop for teachers in Baltimore, Maryland, on ''Using Hubble Data in the Classroom.''

Teays served on a panel discussing evaluation methods for the Web at the Learning Strategies for Science Education Websites conference in Salt Lake City, Utah, as well as presenting an e-poster on Amazing Space, the HST online education site.

Teays was invited, along with C. Runyon (College of Charleston), to give a presentation to the Space Studies Board of the National Research Council of the National Academy of Sciences on ''The Public Use of NASA Data for Education and Public Outreach.'' This was part of a study that the NRC was doing for Congress on the use of NASA data.

Teays was the invited speaker at the Large Telescope Educational Collaboration Workshop, held in Cape Town, Republic of South Africa. He spoke on the ''Hubble Space Telescope Educational Programs.''

Teays served on the Navigator Program Education and Public Outreach Advisory Board. Navigator is a program at the Jet Propulsion Laboratory that amalgamates the EPO activities of several JPL missions and programs related to interferometry.

Teays served on the organizing committee for the first NASA OSS EPO conference, which was to be held in Chicago on Sep 12-14, 2001. Teays continues to work on the organizing of the re-scheduled conference.

Imhoff and Hart, with C. Grady (NOAO & GSFC), presented two dozen astronomy and space-related programs at various branches of the Howard County (Maryland) Library. The programs, funded by a NASA IDEAS grant, provide concepts and hands-on activities targeted for first- and second-grade students. Work is underway to create a website detailing the activities and to create a collection of astronomy-related materials to be used for hands-on science exploration by the children through the libraries.

3. ACKNOWLEDGMENTS

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