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IN SEARCH OF THE SOUTHERN CROSS

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This accounting of a month-long journey through New Zealand, Fiji, and Australia describes the author's observations of the wondrous night skies at these locations, meeting with southern amateurs, and a visit to famous Siding Springs Observatory. The results of a limited study of three unconfirmed Fleming variables are presented. No variation was noted in 21 visual observations of NSV 840 (constant at visual magnitude 7.9), NSV 1214 (constant at visual magnitude 8.3), and NSV 3379 (constant at visual magnitude 7.1). Comments are presented on other southern variable stars observed, including the recently-publicized eta Carinae. Astrophotos obtained with the Anglo-Australian-Telescope illustrate some of the most impressive deep sky objects in the southern heavens.

ARCHAEOASTRONOMY WITH THE HARVARD COLLEGE OBSERVATORY PLATE COLLECTION

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We have been studying variable stars in the Large Magellanic Cloud (LMC) discovered using the MACHO project photometry database. Since these stars were not discovered until the 1990's, it would be of great interest to know their behavior in the past. This is possible using the extensive collection of plates of the LMC contained in the Harvard College Observatory collection. Using these plates, we can make "observations" of these stars as far back as 1895. We have digitized regions of the plates and measured selected stars. Here, we present some preliminary results of this project for three stars: HV 5756, an eclipsing Cepheid; a newly discovered R Coronae Borealis star; and the progenitor of SN1987A.

MULTIWAVELENGTH OBSERVATIONS OF SS CYG AND U GEM

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AAVSO observers have been participating in exciting multiwavelength observations of the outbursts of cataclysmic variables with several satellites such as the Extreme Ultraviolet Explorer (EUVE) and the Rossi X-ray Timing Explorer (RXTE). Through very fruitful collaborations among AAVSO observers, professional astronomers, and the EUVE and RXTE planning teams, these satellites have been pointed at the observing targets within hours of being alerted to the start of outbursts by AAVSO observers. Through simultaneous observations, excellent multiwavelength data have been obtained in the optical, extreme ultraviolet (EUV), and X-ray wavelengths in order to map the physical changes in the accretion disk and to understand better the outburst phenomenon.

We describe the recent unprecedented results obtained from the simultaneous observations by AAVSO observers, EUVE, and RXTE during the outbursts of two bright dwarf novae, SS Cyg and U Gem. Figure 1 shows the multiwavelength light curves of the October 1996 outburst of SS Cyg. This multiwavelength coverage is the best ever obtained of a dwarf nova outburst. The multiwavelength observations show that the outburst starts in the optical band, and about a day later moves to the X-ray band as the gas flow in the accretion disk reaches the white dwarf. About twelve hours later there is a dramatic switch from X-ray to EUV emission. This transition had never been observed before and proved that the X-ray and EUV emissions arise from the same site, probably the boundary between the accretion disk and the white dwarf, and that the transition is the result of the boundary layer becoming optically thick as the mass transfer rate onto the white dwarf increases dramatically (Wheatley, P. J., Mauche, C. W., and Mattei, J. A. 2000, in *Proceedings of the Brian Warner Symposium* (held in Keele, UK, April 1999), in press).

Figure 2 shows the multiwavelength light curves of the U Gem outburst of November 1997. Here the behavior of U Gem is very different from SS Cyg in that X-rays are brighter during outburst and are not quenched. These results may be due to the fact that U Gem is different from SS Cyg in several ways - its orbital period is shorter (4.4 hours) than SS Cyg's (6.6 hours) and the inclination of its oribit is high, almost edge-on to our line of sight. This viewing perspective may be the key to the apparently different X-ray behavior.

We gratefully acknowledge the dedicated efforts and the observations of hundreds of variable star observers around the world. Their observations were vital to the success of these multiwavelength observations.

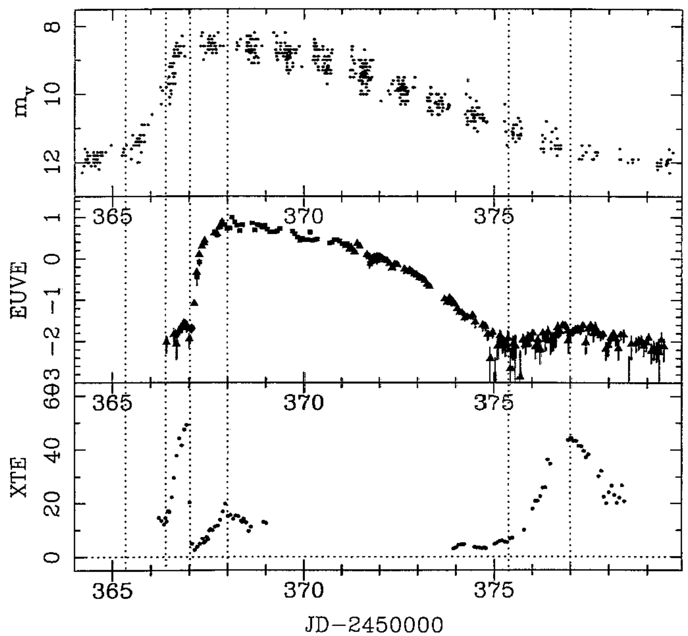

Figure 1. AAVSO, EUVE, and RXTE light curves of SS Cyg during outburst in October 1996. Dotted lines indicate multiwavelength emission transitions.

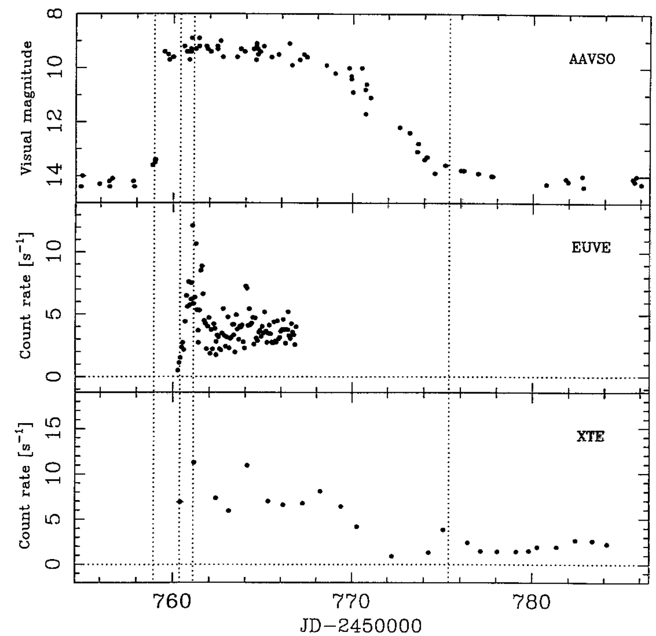

Figure 2. AAVSO, EUVE, and RXTE light curves of U Gem during outburst in November 1997. Dotted lines indicate multiwavelength emission transitions.

A HOME-MADE SOLAR SPECTROSCOPE

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The author outlines the building of a simple solar spectroscope using an inexpensive commercial grating and a variety of left-over optical parts. This instrument is capable of showing hundreds of solar absorption lines, making it an effective tool for personal study and education in astronomy.

THE SOLAR ECLIPSE OF AUGUST 11, 1999

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The author describes the total solar eclipse of August 11, 1999, as viewed by him from Spain, and illustrates his talk with photographs taken by him. The author also discusses sharing the excitement and beauty of astronomy with the public—particularly children and the elderly—through talks and slide shows.

[*Ed. note: It was a delight to meet Jose, a very active solar observer, when he attended the AAVSO Annual Meeting in October 1999 (his first trip outside his native Spain and his first airplane trip), giving his talk and proudly accepting his AAVSO Solar Observer Award for his sunspot observations. He captivated all who met him, and it was with shock and great sadness that we learned of his untimely death from cardiac arrest at the age of 43 in December 1999 in Spain.*

Jose was focussed on bringing astronomy to the public in Spain. He had a great love for the science, and wanted to share its emotional impact as widely as possible. Visiting and speaking at elementary schools and nursing homes with his astronomical photos and equipment, he acted on his earnest belief that one is never too young or too old to learn. Jose uplifted and inspired people, and although his life was too brief, his legacy will be long lasting.]

THE GLOBAL TELESCOPE NETWORK PROJECT

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Global Telescope Network, Inc., (GTN) is a Colorado-based company providing a new level of access to the world of astronomy for educational, scientific, and public use. GTN is selecting two locations in the Northern Hemisphere and two in the Southern Hemisphere to place telescope arrays of 100 systems each that will be accessible over the Internet via high-speed communication lines. In addition to the latest CCD cameras, filters, spectroscopes, and other instruments, GTN will provide on-site access to interested individuals and organizations that wish to use the telescopes for visual and specialized projects.

THE THERAPEUTIC STARS

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Construction was begun on a new children's hospital in the fall of 1999 at Montefiore Medical Center in Norwood, the Bronx. The Amateur Astronomers Association (AAA) gave a couple of starviewing and astronomy presentations to the patients in the present children's wing over the last two years. This year the hospital, already fundraising for a new pavilion, was hit by an inspiration from those AAA visits.

The new building will be a space station in which the children are explorers of the universe! In fact, it's not even called a hospital. It's the Carl Sagan Discovery Center. The concept of the works, now abuilding on 210th Street, was illustrated with pictures obtained for me by AAA's Antoinette Booth and incorporated discussions with Caralynn Sandorf, the project's director. The entire experience of the patients is that of working on the crew of a gigantic spaceship travelling among the planets.

The entry hall has a large rotating globe of the Earth, wall maps of the Bronx and the world, and a ceiling model of the solar system. The wall maps have pushbuttons to light up the address in the Bronx or country of origin for the visitors.

The patients, called cadets, live in cabins, not wards, and are issued an explorer's kit. This has, among other items, a ruler, navigator's compass, magnifying glass, boxes and jars for collections, notebook, pens. Their pajamas are space cadet suits.

There is a central hall with Internet computers for the cadets to receive news from NASA, ESA, and other space-related websites. Wall maps here plot the tracks of various spacecraft. In this regard, NASA may have its InterPlaNet running for the first of the new spaceprobes when the hospital opens in 2003. The cadets will receive realtime news directly from the other planets! For those confined to their cabins, the computers are at bedside on carts.

The roof, in the second phase of the project, will sport an observatory and planetarium. The telescope, of about 400mm aperture, will be fully automated, to reduce the fritter time to aim the instrument manually and to help cadets who have mobility and dexterity constraints. The telescope will be similar to a Meade LX-200.

The planetarium may, just may, be a Zeiss projector. No promises here from Montefiore, but it is studying the Zeiss already in the Bronx. The Bronx has a Zeiss planetarium? Yes! It's in the Bronx High School of Science, just a couple of kilometers away along 210th Street.

This project, so utterly of a nonastronomy purpose, is one crowning achievement of the 20th century for our profession. It crosses that final frontier yet to be approached elsewhere, the mainstreaming of astronomy as a viable and vivid element of culture. Astronomy has been featured as attachments to nonastronomy works in the past. We can look at the sky ceiling at Grand Central Terminal, the long-gone Luna Park of Coney Island, the Sputnik and the Foucault pendulum at the United Nations, the mythical statues and murals of Rockefeller Center, the noon marker at the McGraw-Hill plaza, the sundials on College Walk of Columbia University.

But never on Earth has astronomy been so intimately bound within an structure for so totally a nonastronomy purpose as the new children's pavilion at Montefiore. And it's in the Bronx!

LONG-TERM VRI PHOTOMETRY OF 89 (V441) HERCULIS

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We report 4500 days of VRI photometry of the peculiar high-latitude F2Ibe supergiant 89 (V441) Her, from the AAVSO photoelectric photometry program and from a robotic photometric telescope. We detected the previously-known photometric period of 65.2 days, and also the 283-day period which was previously observed in radial velocity only. We have determined the relative amplitudes and phases of light, color, and radial velocity for each period. The 65.2-day period appears to be due to pulsation. The nature of the 283-day period is less clear; its possible origin will be discussed. We have constructed the best available (O-C) diagram; it suggests that the 65.2-day period is increasing on a time scale of a few hundred years.

LONG-TERM VRI PHOTOMETRY OF RHO CASSIOPEIAE

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We report over 5700 days of VRI photometry of the yellow hypergiant variable star rho Cassiopeiae, from the AAVSO photoelectric program and from a robotic photometric telescope. The (V-I) color curve is generally in phase with the light curve on time scales of a few hundred days, but there is a 4000-day variation in color which is absent from the light curve. The approximate ratio of (V-I)/V is 0.46. The most conspicuous period in the light curve, autocorrelation diagram, and power spectrum is about 830 days, but there are also less conspicuous variations on time scales of 200 to 500 days. Since the most recent comprehensive analysis of the light curve of rho Cas found a dominant period of 300 days, we conclude that the behavior of the star is quite variable with time.

THE IMPACT OF THE *HENRY DRAPER CATALOGUE* ON 20TH CENTURY ASTRONOMY

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By 1900 there was a definite need to update the great star catalogues of the nineteenth century. First of all, the stellar coordinates in the *Bonner Durchmusterung* and other star catalogues were pinned to the epoch of 1875. Then, too, there was no systematic scale for stellar magnitudes. Finally, the nineteenth-century catalogues were all published before astronomers had any ideas, let alone data, for classifying large numbers of stars by their spectra.

Under the leadership of Edward Pickering and the financing of Anna Palmer Draper, the work on the Henry Draper Memorial began at Harvard College Observatory in the late 1880's. Its primary goal was to gather and classify the photographic spectra of about 100,000 stars. As a test case, Pickering had Williamina Fleming develop a simple classification scheme and apply it to the spectra of about 10,000 stars. The *Henry Draper Catalogue* was published in 1890. For the next two decades, Pickering worked to have astronomers approve the Harvard Classification scheme before having Annie Jump Cannon begin the larger project of classifying 100,000 stars.

Cannon was so efficient at classifying stellar spectra that she examined about 40,000 stars in the first year and 60,000, the second year, for a total of 100,000 in two years. Rather than limiting the project to that number at that time, she continued classifying spectra for another two years for a total of 225,300 stars in four years of work.

Although Cannon completed the classification of the stars in 1915, the first of nine volumes of the *Henry Draper Catalogue* was not published until 1918. At that time, it was greeted with enthusiasm and congratulations from eminent astronomers around the world: Jacobus Kapteyn in the Netherlands, Herbert Hall Turner in England, Harlow Shapley in California, to name a few.

Subsequently, the HD Catalogue has continuously been a source of data for all sorts of investigations of the Milky Way. Today, the data in it are now available online and are still widely used as a coherent source for a variety of ongoing investigations.

MASS LOSS LAWS AND MIRAS

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Over the past couple of decades, many astronomers have looked for formulae relating mass loss rates to the properties of stars. Such “mass loss relations” have been derived from observed mass loss rates and from theoretical computations. To compare these relations, the predicted mass loss rate vs. luminosity for each is found using a single set of evolutionary tracks (= a relation between R and L and M). Some interesting “pairings” of predictions result, as it becomes clear that different methods measure different aspects of the final mass loss epoch that takes Miras to white dwarfs.