

## RESEARCH EXPERIENCE

*Summer 1996*

### **AN INTERACTIVE WEB TUTORIAL FOR THE WORLD COORDINATE SYSTEM TASKS OF IRAF**

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The Image Reduction and Analysis Facility (IRAF) is an image processing and data reduction program used by astronomers. Comparing images from different telescopes requires information about the coordinates of the field of view and the type of telescope used. This World Coordinate System (WCS) information must conform to a strict format which can be very difficult to master. For this reason, IRAF features several WCS routines which automate the process of formatting and inserting the information into the image headers. We used HTML and CGI scripts to develop an on-line tutorial so that astronomers with access to the Internet, whether or not they have IRAF loaded on their machines, can learn what WCS is about and how to use the IRAF WCS tasks.

This research was supported by an NSF REU grant and was presented as a talk at the 1996 NOAO Summer Research Conference.

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### **AN INVESTIGATION OF THE FAR-INFRARED EMISSION OF THE GALAXY WITH DIRBE DATA**

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We present a study of the diffuse infrared emission of the local interstellar medium for the region ( $42^\circ < l < 146^\circ$ ) and ( $10^\circ < b < 50^\circ$ ). The study was performed using the DIRBE 90 degree elongation data at 60, 100, 140, and 240 microns. After removing a simple cosecant model of the zodiacal emission, we calculated the mean flux density ratios for the six colors. The I60-I100, I60-I140, and I60-I240 flux density ratios deviate from the mean flux density ratios as a function of galactic longitude by an average of 36%, 50%, and 58%, respectively. The I100-I140, I100-I240, and I140-I240 ratios show a similar but weaker longitude dependence. This indicates that the population density of the smaller grains (less than 0.01 micron) are more variable than the population density of the larger grains.

This research was supported by an NSF REU grant, was presented as a poster paper at the 1996 American Astronomical Society meeting in San Antonio, TX, and was published as part of [SNAITH, S., CIARDI, D. R., and THOMPSON, R. R. An Investigation of the Far-Infrared Emission of the Galaxy with DIRBE](#), Bulletin of the American Astronomical Society, Vol. 27, p.1304 (12/1995).

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### **USING THE WORLD WIDE WEB FOR ASTRONOMY EDUCATION AND RESEARCH**

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We explored ways in which the seemingly boundless resources of the World Wide Web (the Web) could be utilized for astronomy education and research. On the Web, scientists, professors, students, and amateurs from around the world find a forum in which to share ideas, theories, data, and tips. Searching for information, however, can be a daunting task due to the non-linear interconnectedness of the Web, and no search can be considered exhaustive as the information is constantly growing. Taking this into account, we used indices and search engines and also networked to find out what resources other astronomers were using and how they were utilizing them for astronomy education and research. What we found varied greatly in content: from link pages (which merely pointed to other useful pages) to searchable databases of abstracts and articles. Some sites combined images, audio, and text to create a "virtual tour" of the heavens, and several educators used the Web as a "virtual textbook." We expect these resources to be more fully utilized in future astronomy curricula.

This research was supported by the Agnes Scott College SPARC Program and was presented as a talk at the 1995 Agnes Scott College Spring Annual Research Conference in Decatur, Georgia.

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### **ULTRAVIOLET EMISSION AS AN INDICATOR OF ACTIVITY IN COOL STARS**

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This study focused on discovering the correlation of time-based variance of activity in G to M class stars as indicated by ultraviolet emission line strengths. Emission lines of Lyman alpha, HeII, CI, CII, CIV, OI, SiII, and SiIV were measured in 22 stars. We specifically searched for a correlation between Lyman alpha and other indicators of chromospheric and transition region activity, using only the spectra from the International Ultraviolet Explorer observatory which had been processed with NEWSIPS for the final archive. We developed original IDL procedures to automate the extraction of the total line emissions and to correct for geocoronal Lyman alpha emission. We found a high degree of correlation between these activity indicators over time.

This research was supported by NASA grant NAG8-148, was presented at the 1994 University of Georgia Summer Research Conference in Athens, Georgia, and was published as part of [Annual Reports of Astronomical Observatories and Departments: Georgia, University of, Department of Physics and Astronomy](#), Bulletin of the American Astronomical Society, Vol. 27, p.156 (01/1995).

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### **FOUR COLOR IMAGING OF THE SEYFERT GALAXY 3C 120 EXTRAGALACTIC JET**

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We studied the morphology of the extragalactic jets emanating from the active galactic nucleus (AGN) of the Seyfert galaxy 3C 120. These jets provide information about the super-massive black holes believed to power AGN such as this, and they also serve as probes of the intergalactic medium with which they interact. Although most jets of this type radiate only in the radio part of the spectrum, the jets of 3C 120 also radiate in the visible, providing additional information about their characteristics. We enhanced the images using VISTA image processing software and found that there was also a much smaller counter jet. Examination of the colors of the jets revealed no color gradient, which would have indicated non-thermal synchrotron radiation.

This research was supported by the Agnes Scott College SPARC Program, was presented as a poster paper at the 1994 Agnes Scott College Spring Annual Research Conference in Decatur, Georgia, and was published as part of [SADUN, A. and SNAITH, S., Jet and Counterjet in the Seyfert Galaxy 3C 120](#), Bulletin of the American Astronomical Society, Vol. 26, p.957 (05/1994).