

# Report from the Space Telescope Science Institute

## 1. Measuring Machine Modifications

The program of modifications to the ST Sci scanning microdensitometers, as reported in the previous Newsletter has continued. For the first of the two machines, all elements of the new servo system and the upgraded data-acquisition and control elements have been integrated, and systemic tuning is now in progress, with recommissioning planned for January, 1993. The same modifications will be installed in the second machine later this year.

In parallel with this work, a new set of optics has been prototyped and is being prepared for installation. The major features of this are laser illumination, which provides sufficient flux to permit short pixel times even at high densities, and which enables acousto-optic (AO) beam steering. The integrated light outside the main spot is below  $10^{-4}$ , so that high photometric integrity is maintained. The AO deflector, driven from a linear function of the y-servo error, will remove residual 'chopping' due to y-servo unbalance introduced by irregularities in the ways, and it will also be stepped to provide multi-channel capabilities. These elements will be installed in the summer.

## 2. Scanning of Second Epoch Survey Plates

Scanning of both the POSS-II and SES plates has been continuing on one PDS while the modifications to the other have been in progress. The plates are being scanned as 23040 x 23040 rasters with 15-micron (1.0 arcsec) pixels; about a hundred plates were scanned in 1992. Production rates will increase as the modified machine is commissioned and then again when the multichannel system comes on-line.

## 3. Guide Star Catalogue

In August, version 1.1 of the GSC incorporating a number of improvements over the original publication was released to the community on CD-ROM. The Tycho Input Catalogue (Egret et al. 1992) was used to supplement the GSC plate measurements by providing information on bright stars which are either missing from GSC 1.0 or poorly measured from the Schmidt plate material. In addition a new photometric calibration algorithm was applied to the GSC, improving the reliability of the extrapolation beyond the magnitude range of the GSPC-I sequence stars.

A large number of non-stellar objects on the halos and spikes of the brightest stars were identified as probable image artifacts. These were reclassified in the GSC, as were a number of blended pairs of stars. In addition, all reported misclassifications of individual objects were repaired.

Work is continuing on improving the GSC, with an all-sky astrometric recalibration based on the subplate reduction method (Taff et al. 1990) currently in progress. This version (GSC 1.2.1) will be completed by summer.

## 4. Second HST Guide Star Photometric Catalogue

Work on this catalogue (Postman et al. 1992) to provide faint CCD photometric standards for the standard survey fields is still underway. To date, approximately 62% of the northern fields have been reduced and accepted as satisfactory. Small subsets of the prepublication data may be available for comparison to other standards as a quality check. If interested, please contact Marc Postman at ST Sci.

## 5. Image Compression and Distribution

Compression of the digitized scans that have been made for HST operations continues with the goal of distributing them to the community over the next 3 years. The data include the Palomar POSS-I E plates in the north and the SERC J plates in the south. The plates were all scanned using modified PDS microdensitometers as 14000 x 14000 rasters with a pixel size of 25-microns (1.7 arcsec). These data are being compressed by about a factor of 10 and will be distributed on a set of

about 100 CD-ROMs.

The project work is being carried out with NASA funds based on the results of a recent ST ScI survey of potential institutions that would be interested in obtaining a CD set by sharing the costs of mastering and duplication of the discs. As of the end of December 1992, 30% of the southern sky has been compressed, with completion of this hemisphere planned for May 1993. Additional information on the distribution of the data will be announced in the near future.

## 6. Optical Identification of ROSAT Sky Survey X-ray Sources

B. McLean, R. Burg and R. Giacconi are continuing a project to find optical counterparts of sources in the northern hemisphere detected during the ROSAT X-ray Sky Survey. The images from the optical disk archive around each X-ray source are being automatically extracted, the optical objects detected, positions, magnitudes and classifications are derived (McLean & Burg 1991) and delivered to the ROSAT project at MPE. All of this information is providing a sample of clusters for the ST ScI group in collaboration with Huchra and Bohringer to study the luminosity function of galaxy clusters with follow-up imaging and spectroscopy. A preliminary list of 400 candidates in the 9–17h range has been derived based on a minimum flux, hard spectra and extended size parameters. These have been examined on the survey plates images and a subset have been observed with both the MMT and the 48" telescopes at Mt. Hopkins for redshifts and deep CCD imaging. Initial results show a high detection rate (>75%) and a significant number of clusters that were not identified by Abell. We plan to continue this work for the next several years, refining the X-ray selection criteria and obtaining ground-based observations in order to compare the morphology, spatial distribution and luminosity functions of these clusters. The deep X-ray imaging by ROSAT at the ecliptic poles is producing a list of very faint, extended sources that require optical identification. Initial results (Burg et al. 1992) seem to indicate the presence of a moderate redshift supercluster in this area.

## 7. The ST ScI Archive for Proper Motions

The ST ScI scanned POSS/Quick-V archive is useful for the determination of reliable relative proper motions down to 0.03/yr in the visual magnitude range 10–18. D. Jack MacConnell and W. James Roberts are completing an analysis of the proper motions in two plate regions, one centered on the North Galactic Pole, and one at a lower latitude toward the bulge. Their results will be compared with other available results for the NGP region, and they will demonstrate the uses and limitations of their method for galactic kinematic studies. The faintness of our magnitude range, which begins near where the PPM (Position and Proper Motion) Catalog leaves off, enables us to sample bulge and halo proper motions at considerable distances from the Earth.

## 8. Image Simulation

A collaboration between the ST ScI (M. Lattanzi and B. Lasker) and Osservatorio Astronomico di Torino (L. Pividori and L. Lanteri) is directed to the improvement of centroiding algorithms for images on Schmidt plates. The first step of this program, implementing a test environment for centroiders, has been completed; this is based on an image simulator (including a noise model) which produces excellent approximations to images from the UK Schmidt and the Palomar Schmidt over the entire usable magnitude range. Experiments with the classical centroiders (center-of-gravity, Gaussian), as well as various correlation approaches, are currently in progress.

## References

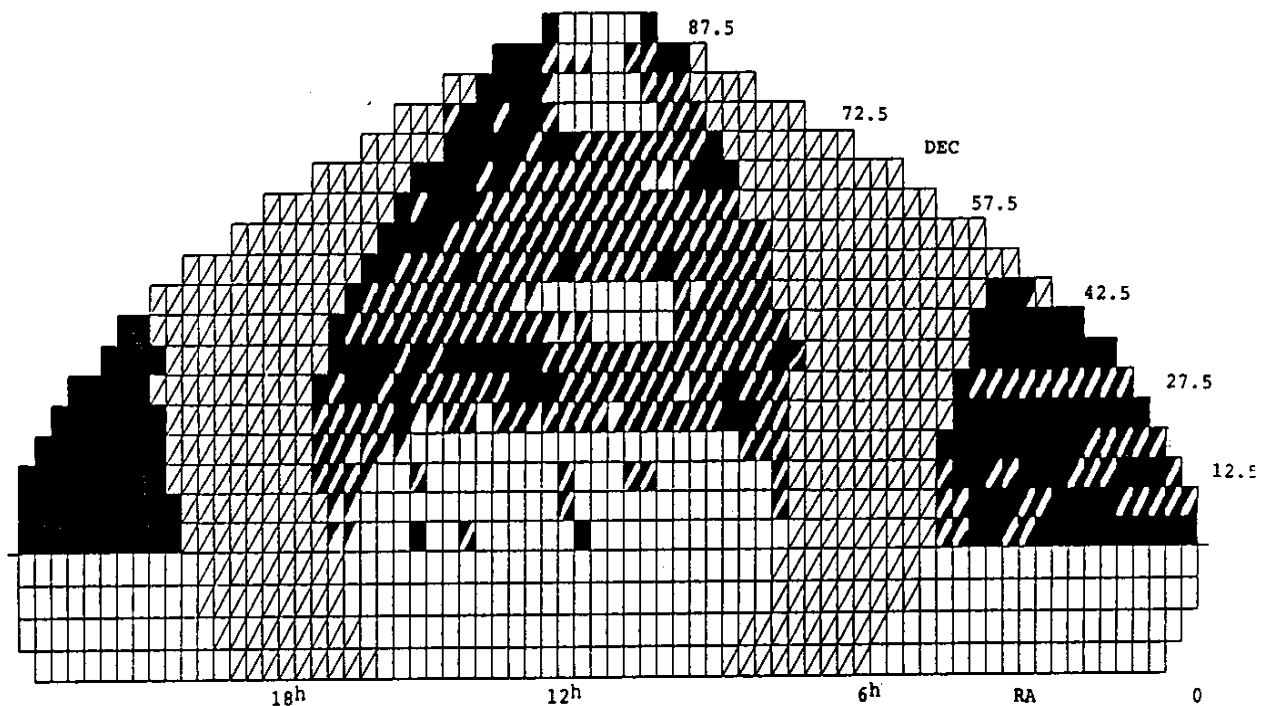
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*Brian McLean and Barry Lasker*  
*Space Telescope Science Institute*  
*3700 San Martin Drive*  
*Baltimore*  
*MD 21218*  
*U.S.A.*

## The Hamburg Schmidt Survey

The Hamburg Observatory is currently carrying out an objective prism survey on Schmidt plates taken at the Spanish-German Astronomical Center (DSAZ) on Calar Alto/Spain (Engels et al., 1988). The Schmidt telescope was moved in 1980 from Hamburg to Calar Alto. The telescope is an  $f/3$  instrument with a mirror diameter of 120 cm and a free aperture of the correction plate of 80 cm. We use a 1.7 deg objective prism providing unwidened spectra with a dispersion of  $1390 \text{ \AA/mm}$  at  $H_\gamma$  on hypersensitized KODAK IIIa-J plates. The field size on the 24 x 24 cm plates is  $5.5 \times 5.5$  deg, giving a scale of  $12 \mu\text{m/arcsec}$  on the plate. Under conditions of good seeing the FWHM of the images is  $30 \mu\text{m}$  (plate resolution) giving a spectral resolution of  $45 \text{ \AA}$  at  $H_\gamma$ . For each field two prism plates are taken to identify spectra of interesting objects with higher reliability. Additionally a direct plate is taken to determine accurate positions, and to recognize overlaps and extended objects. The current coverage is shown in Fig. 1. A complete coverage of the fields with  $\delta > 0^\circ$  and  $|b| > 20^\circ$  is planned until 1996. Until the end of 1992 we obtained 735 prism and 490 direct plates in 450 fields, covering about  $12,000 \text{ deg}^2$  of the sky.



**Figure 1.** Coverage of the Hamburg Schmidt Survey until the end of 1992. Half colored fields have one, while full colored fields have two prism plates.