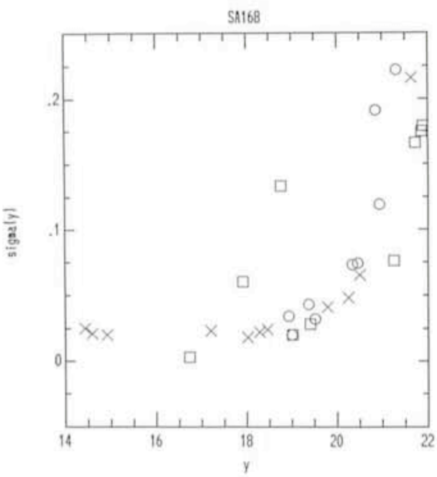


Figure 4: *$\sigma_y$ versus y for three frames in SA 168. The magnitudes are in the instrumental system, but the transformation coefficient is about unity.*

test standard stars. Our results are surely depending on the detector linearity. $m_1$, $c_1$, and (b-y) have almost linear transformations whereas V includes, as expected, a more significant colour term.

## Results

Figure 4 shows as an example the variation of $\sigma_y$ with y for three frames in the selected area SA 168 and apparently $\sigma_y$ stays below the maximum acceptable error 0.02 mag down to about the $19^{th}$ mag. The three other colours have an identical behaviour.

Towards the SGP we have so far identified about 39 F stars, $0.2 < (b-y) < 0.4$ mag, in the whole magnitude range down to V = 20 and in a solid angle only ~one tenth of a square degree. 33 of these stars also have good u measurements, so the sample already is of some significance.

When u, v, b and y are obtainable with an error 0.02 mag, the study's objective to investigate the [Fe/H] variation of the F stars beyond D = 5000 pc from the plane seems within reach. We have $\sigma_{[Fe/H]}$ = 0.4 dex and $\Delta D/D \sim 20\%$ or better. However, we do not see how the error may be improved to better than ~0.01 mag or ~1% implying that the best obtainable error is 0.3 dex in the metal content [Fe/H]. Regarding F stars, observations are just feasible at 5 kpc from the plane with a 1.5-m telescope.

It will be particularly interesting to see the relative population shift with distance, but also to see if there exist stars with solar metallicity at these remote distances.

As our general results are not too encouraging concerning the obtainable errors we want to stress that it seems possible to do CCD photometry – also in the u region – in the field without having to establish standards in each frame.

We should mention that the reduction of the several thousand frames forming the basis of this note have been performed with the MIDAS, IRAF and DAOPHOT packages.

# δ-Scuti Stars in NGC 6134

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The CCD camera on the Danish 1.5 m telescope has been used to obtain exposure time series of small areas in open clusters. The purpose is to study the frequencies of different types of pulsating variables. Very low noise levels have been reached by the use of differential photometry carefully considering the error sources.

## Noise Levels

To illustrate the high precision one can obtain with CCD's, we present the data from one night in late May 1988 on NGC 6192. Exposure times were 20 seconds and exposures were collected each minute for nearly 7 hours. The time series has some gaps, when tapes had to be changed or the seeing and the tracking checked. The resulting 370 frames were reduced with the DAOPHOT package and relative magnitudes determined for all reasonably isolated stars. A small set of not too bright, well isolated stars define the reference.

Two corrections turned out to be of critical importance. A colour correction to eliminate differential extinction effects on stars of different colours. And a correction for non-linearity of the CCD. The CCD (# 8) turned out to have a nonlinear response at high exposures before saturation of the order of two per cent. Consequently, for the bright stars, the change of seeing introduces a variation due to the non-linearity. We were able to correct for this effect using the large number of exposures and large number of stars we have.

All time strings were transformed into power amplitude spectra. Figure 1 presents the mean amplitude in three frequency intervals for stars over a range of 7 magnitudes. For high frequencies the amplitudes scatter very little about a

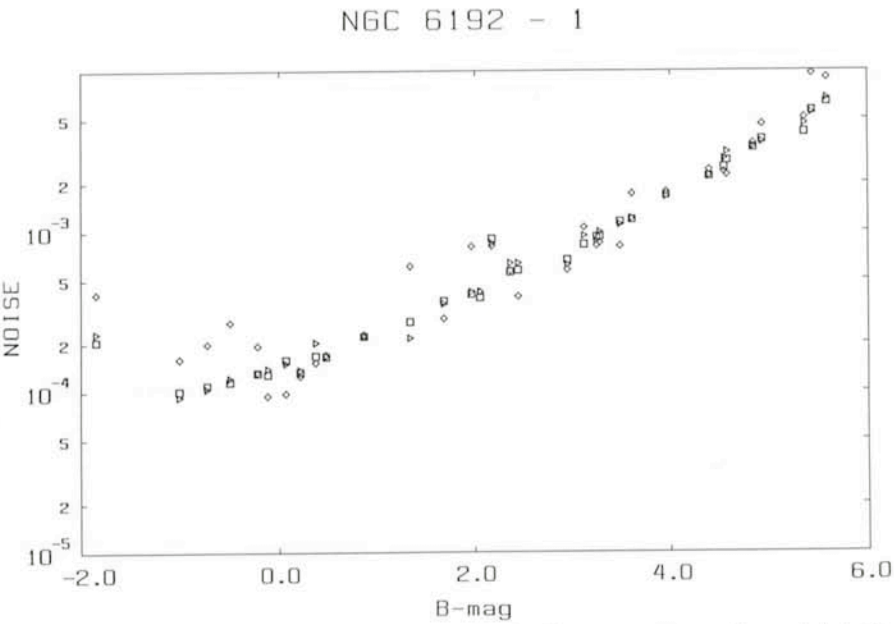


Figure 1: *The noise level for different frequency intervals. Squares correspond to periods in the range 3–10 min, triangles 10–60 min and diamonds 1–2 h. The abscissa is the B magnitude relative to a set of reference stars on the frame.*

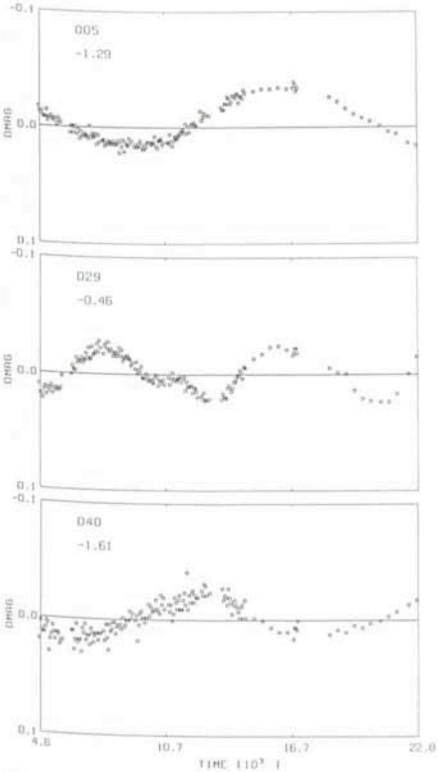


Figure 2: *Light curves for three stars in NGC 6134. Time is given in units of thousand seconds. The curves are labeled by a running number and the same relative magnitude as used in Figure 1.*

TABLE 1: *Properties of the δ-Scutii stars in NGC 6134*

| # | B(mag) | $(B-V)_o$ | $M_B$ | A | P(hours) |
|---|---|---|---|---|---|
| 5 | 12.73 | | 1.11 | 0.0252 | 4.161 |
| 29 | 13.04 | 0.275 | 2.10 | 0.0176<br>0.00785 | 2.329<br>1.089 |
| 40 | 12.50 | | 0.89 | 0.00838 | 3.358 |

line, mainly determined by the photon statistics. The brightest star is overexposed. A noise level of 0.0001 mag is reached for the brighter stars. One of the high points for the lower frequency band corresponds to a variable, the others are caused by the influence of close neighbours. Other time series give similar diagrams, and under reasonable weather conditions the noise limit reached does not seem to contain any instrumental effect. We do not seem yet to have reached a lower limit, where the instrumental noise starts to dominate. Gilliland and Brown (Ref. 1) reached the same conclusion using a Tektronix 512 × 512 chip.

## Variables in NGC 6134

In NGC 6192 only one variable star of unknown type was found (Ref. 2). In the older cluster NGC 6134 ($t \approx 10^9$ y), three δ-Scuti stars have been located. The light curves from one night are plotted in Figure 2. An additional short time string was obtained 8 days later and helps to define the periods better. Two of the stars pulsate in only one mode, whereas the third has at least two modes. The periods and amplitudes are given in Table 1.

Star number 40 is the brightest and slightly overexposed which is reflected in the increased noise compared to the fainter star number 5.

The result of our search for δ-Scuti stars so far indicates that these stars are common only in fairly old clusters like NGC 6134 or NGC 2660 (Ref. 3). They seem to be nearly missing in young clusters. We still need to verify the suspected high number of δ-Scuti stars in NGC 2660, which could not be observed during our last expedition in May-June 1988.

The reason, why some stars in the instability strip near the main sequence pulsate and others do not, is still unknown, but the studies of clusters will be able to tell more precisely under which conditions pulsation is favoured.

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# Imaging Polarimetry of High Redshift Radio Galaxies with EFOSC


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Most of our visual perceptions of the world around us, particularly in daylight, are derived from radiation which has been reflected or scattered. Consequently, we are continually bathed in linearly polarized light, even if only the loyal followers of M. Minnaert (1954) use the phenomenon of "Haidinger's Brush" to make themselves aware of it. At night, by contrast and with the exception of the Moon and planets, most of the astronomical sources we see are both self-luminous and highly spherically symmetric. Polarized light in astronomy is therefore the exception rather than the rule but, when it is observed, it can prove a valuable diagnostic either of exotic radiation mechanisms or of anisotropic scattering geometries.

In the study of active galactic nuclei and quasars, the measurement of optical polarization, both from synchrotron sources in nuclei, jets and "hot-spots" and from scattering around obscured sources, is a fruitful field of interest which is producing some remarkable new results. "Hidden" Seyfert 1 nuclei are being found in Seyfert 2 galaxies by looking at the polarized flux produced by the scattering of nuclear light from either dust particles or electrons which have a more direct line of sight to the activity than do we (Schmidt and Miller 1985).

At radio wavelengths, radio galaxies are known to be highly anisotropic ob-


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