b): **Photographic Techniques**

1 Introduction

I am very pleased to find that the interests of the astronomical photographic community have been incorporated into the Wide-Field Imaging Working Group. While the remit of 'Wide-Field Imaging' does not completely embrace all of photographic astronomy, this Group covers all the most active areas and is broad enough to include most applications of photography in our science. More important, the Group provides a potentially lively and conspicuous forum for those of us who believe that photography has something unique to offer the astronomical community. It is up to us to display our wares and exchange ideas.

So why should we persist with photography in the age of the CCD? It turns out that there are many reasons. The photographic emulsion is a detector with a DQE of a few percent over sensitive areas that are measured in large fractions of a square metre. This sensitive surface has astonishing uniformity and is covered with pixels that are small compared with those of most CCDs. Not only is this remarkable detector readily available, but it is relatively inexpensive and most existing telescopes are equipped to use it without modification. As well as being a rich source of scientific discovery, both serendipitous and statistical, the photographic plate is an excellent storage medium. Almost incidental to its scientific rôle, photography is able to produce pictures that are exciting to look at, a characteristic that other solid state detectors have yet to match.

Given these properties, it is not surprising that photography is extensively used for wide-field survey purposes, and a detailed discussion of its problems and potential compared to CCDs has been given by West (1991). A broader view of the future of astronomical photography and the reasons for its present state has been presented by Malin (1988).

2 New Activities

It was reported by Ken Russell (UKST) at the 'Digitised Optical Sky Surveys' meeting in mid 1991 that experiments with Tech Pan film based material in the UK Schmidt had proved very promising, at least from the image quality point of view, though this improvement is not obvious from simple inspection of the original films. It is evident that Tech Pan has considerably better spatial resolution and finer grain than the widely-used IIIa emulsions. These improvements come at almost no extra cost in exposure time and the contrast is about the same as IIIa-F. The initial tests imply that in good seeing, IIIa emulsions in the UK Schmidt are probably undersampling the image, and that the DQE of the film-based material must be considerably higher than the similarly sensitised IIIa-F.

The possibility of using this improved film-based material for Schmidt surveys (e.g. see the article by Phillipps and Parker in this newsletter – Ed.) immediately raises some interesting questions, some of which I hope the Working Group will be able to address. These are concerned with its spectral sensitivity and with the mechanical problems of using a film-based product.

The astronomical community acquired a new passband with the introduction of the IIIa-J emulsion 20 years ago. Though this emulsion revolutionised astronomical photography, an unwanted side-effect was that the long established B and V

passbands languished, with only the older, relatively coarse-grained emulsions being available in the O and D sensitizings on which the B and V passbands were based. Tech Pan offers yet another passband, strongly peaked around 656nm, reflecting its origins as a solar flare patrol film. The Working Group must consider if the improved imaging properties of Tech Pan justify asking the manufacturer to make O, D or F sensitizings with Tech Pan-like imaging properties.

The second problem concerns the use of a film-based material at the strongly-curved focal plane of the large Schmidts. Persuading film to comply with this surface introduces non-uniform deformations which may not recover fully in the way that glass does, with obvious consequences for astrometry. Tests are planned to assess the seriousness of this problem.

One of the things that digitisation of images makes possible is the ability to combine many plates of the same field with consequent improvements in the signal-to-noise ratio. This is especially valuable where many plates of the same field already exist, as is often the case with Schmidt surveys. Similar image addition of large areas can be done more quickly in the darkroom, but the photometric information is lost in the output. Tests are about to be conducted which are intended to compare photographic and digital addition of identical plates. It may be possible to take advantage of the speed of the photographic approach and then recover the photometric information by digitising the final combined photographic image.

These activities underline the value of a group that brings together workers in all these areas. No doubt recipients of this Newsletter will have their own views on topics to be discussed and I would be delighted to hear from them.

References

[1] West, R.M., 1991. *ESO Messenger*, Issue **65**, September 1991, 45-50.

[2] Malin, D.F., 1988. In *'Astrophotography', Proc. IAU Photographic WG meeting Jena 1987*, pp. 2-20, ed. S. Marx, Springer-Verlag, Heidelberg.

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