

Reports from the Sub-Sections of the Working Group

a): Sky Surveys and Patrols

In common astronomical terminology, *Sky Surveys* refer to observational programmes which aim at the *one-time recording* of a (significant) part of the sky, by (deep) direct or spectral exposures in different wavebands. The famous Palomar Observatory Sky Survey (POSS I) which covered the sky between declinations $+90^\circ$ and -30° is a typical example of this kind of work, although nowadays the term ‘Sky Survey’ is also used for radio-, IR-, X-ray and γ -ray programmes. Sky surveys are powerful tools when searching for particular types of astronomical objects, selected by morphological, colour or spectral criteria.

Sky Patrols are special surveys, which aim at covering a large part of the sky at *regular and frequent intervals*, in order to provide a continuous record of the sky and to document changes. Here, the long-term Harvard and Sonneberg Patrols first come to mind, each of which has produced several hundreds of thousands of photographic recordings. Because of the need to cover very large areas in a short time, patrols have been less deep than surveys, but have also led to innumerable discoveries, in particular of time-variable objects, such as minor planets, comets and variable stars. Sky Patrols also allow the investigation of objects retrospectively, for instance to learn how the luminosity of a recently discovered quasar has changed during the past century.

Sky surveys and patrols have eternal value, because we can never repeat an astronomical observation under completely identical circumstances: the epoch will always be different. By doing this kind of research, we pass on to future generations of astronomers an immense treasure of data, of which certain parts are bound to become very useful some day. However, we of course do not know which parts and for this reason, it is desirable that the data are as ‘clean’ as possible and they must in any case be extremely well documented and, wherever feasible, well calibrated.

It is exactly this unique mission of sky surveys and patrols that renders that type of work so valuable. To some it may appear rather monotonous, but experience shows that not only do the involved astronomers reap a bountiful harvest of discoveries now, they also do a great service to all our successors in the near and distant future. Just think about some of the labour-intensive surveys/patrols of the past, for instance the great Bonner Durchmusterung of the 19th century, which now provides an excellent check on various astrometrical measurements, or, to go further back in time, the careful record of historical supernovae and novae, collected over centuries by visual sky patrols in ancient China.

Clearly, it is our moral duty and in our own interest to continue such a tradition and to ensure that this kind of long-term work will not be forgotten amidst the natural enthusiasm for spectacular observations of one-time astronomical events and peculiar, individual objects. It must be admitted, however, and I think that it is quite understandable, that many younger astronomers are rather reluctant to embark upon this type of project at an early point in their careers!

We have at this moment arrived at a new crossroads in the development and execution of sky surveys and patrols. On the one hand, we master the art of producing the deepest possible sky surveys, witness the efforts in the USA and Japan

in the north, and in Australia and Chile in the south. The progress is impressively demonstrated when comparing the first Palomar Survey (POSS I) with its successor, POSS II, now being produced. On the other hand, it is sad to record that recently the Harvard patrol was discontinued and that most probably also the Sonneberg patrol will soon be stopped, after many decades of continuous action. In both cases the decision seems at least partly to have been caused by the opinion of the respective funding authorities that the ever sparser funds may be better used than to support operations with well-tested, but no longer very modern equipment at less-than-optimal sites.

But this should not lead us to believe that sky patrols are no longer needed! On the contrary, I am convinced that the time has now come to reconsider this basic area of observational astronomy, in terms of instrumentation and strategy.

Enter the quantum efficient, but still rather small CCDs. How and when will they take over after the photographic plates which have been the unsurpassed detectors during more than 100 years of astronomical sky surveys and patrols? I have attempted to give a partial answer in a recent article (ESO Messenger, 65, 45: September 1991), which was based on a talk given at the October 1990 meeting of the former IAU WG on Photography and to which the reader is referred for more details.

Briefly, I do not think that the time has come yet to equip the large Schmidt telescopes with CCDs. Even the biggest CCDs are still so small that a change would rob the Schmidt telescopes of their unsurpassed ability to produce high resolution imaging over a very wide field — and hence their usefulness for deep surveys.

However, I could imagine that it would now be reasonable to consider a rebirth of sky patrols, based on mosaics of large CCDs in medium-size, e.g. 2 m telescopes, since for this type of work, a somewhat lower angular resolution seems acceptable. Such ‘patrol telescopes’ would be fully dedicated to sky patrols in order to be efficient and reach the faintest possible limiting magnitudes. Two telescopes at the best possible sites, one in the North and one in the South, could patrol the entire sky down to the quite faint magnitudes, say once per month. This would secure a lasting record of the sky and, if powerful on-line reduction facilities are also set up, at the same time provide unequalled opportunities for discovery of ‘interesting’ objects some of which would then be further observed with larger telescopes, including those of the new generation of giants, the Keck, the ESO VLT, the Japanese 8-m, and possibly others.

I note in this connection the recent surge of interest in search programmes for Near-Earth Objects, as demonstrated by various new undertakings like the — for some time very active and successful — Spacewatch facility in the USA, the recent San Juan Capistrano Workshop sponsored by NASA, the Workshop NEO-91 in Saint Petersburg (formerly Leningrad) in Russia, the creation of IAU and NASA Working Groups on NEOs, and the plans for a dedicated European NEO search facility.

However, the NEO search techniques may not be optimally suited for full-sky patrols and there is of course always the critical question about how the enormous amounts of recorded data will be archived. This is a major problem in all current CCD work. But even if NEO facilities may be too special for sky patrols, it will clearly be very useful to establish close links with this community and to see how the various observational needs can best be taken care of.

The above thoughts are provisional only and serve to call attention to what I perceive as a compelling need for action. There may be different ways to proceed, and this theme will undoubtedly be further discussed within the WG on Wide-Field

Imaging.

In the meantime, I would be interested in receiving opinions from all interested persons, especially from the WG members. Are we ready to consider restarting regular sky patrols by means of wide-field, dedicated CCD telescopes? If so, which kind of telescope? What kind of CCD and in which configuration? To which limiting magnitude? Are there any groups or observatories who would like to embark upon such a project, or at least to carry through an first appraisal of the technical and organisational problems?

I look forward to your reactions!

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