

# Amateur Astronomy with CCDs

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Watch out professionals, the amateurs are coming!

In the last few years a dream came true for the amateur astronomers. With the arrival of relatively low-cost CCD cameras on the market, it became possible to join the astronomical imaging revolution. At the same time, amateurs have begun to have access to powerful imaging tools, similar to those used by professional astronomers at ESO and around the world for their work.

All amateur CCD cameras of the first generation are based on the same Texas Instruments chip (TC-211) with 192 by 165 pixels, each measuring 13.3 by 16 micron. Although this chip has a surface of only 2.5 by 2.5 mm and because of the rather high electronic readout-noise, it is still possible to obtain really impressive results when compared to conventional photography. Richard Berry, the former editor of *Astronomy* has written some image processor programmes (ImagePro, QuickPix and ColorPix) for the most popular amateur CCD cameras on the market.

So all you need to do amateur observations is a good telescope, the CCD camera and a PC. If you are the happy owner of a Laptop computer it is also possible to go outside with a portable

telescope and to benefit from the dark skies in the Alps or somewhere else.

For the images shown here, I used the Lynxx CCD camera from Spectra Source; it is the only first-generation camera with 12-bit resolution, all the other cameras have only 8 bits. It can easily be attached to any telephoto lens or telescope, making it possible to convert the CCD head from a wide-angle camera into a high-resolution planetary camera within a few minutes.

For example, the images of comet P/Swift-Tuttle (Figs. 1 and 2) were obtained with a 500-mm telephoto lens with a resulting field width of 16 arcminutes. the image of Saturn (Fig. 3) was made with an effective focal length of six metres, which corresponds to 0.4 arcsec per pixel.

It is also possible to create colour pictures by superposing in the computer three single exposures taken through three different colour filters.

The Lynxx CCD camera was also used at the 1.06-metre amateur telescope in Puimichel in southern France. This telescope was completely built by the Belgian amateur astronomer and mirror maker Dany Cardoen. The Amateur Observatory Puimichel lies in a beautiful landscape with many clear

dark nights near the professional Haute-Provence Observatory in Southern France.

In the meantime, the next generation of amateur CCDs has begun to appear on the market and the future in digital imaging for amateurs looks extremely promising!

Larger chips and more sophisticated electronics and programmes now provide possibilities to which only professional astronomers had access a few years ago. For example, the new ST-6 camera from SBIG works with a CCD which is 8 times larger than the TC-211 and has 16 bit resolution. Next year another Lynxx model with a 500 pixel CCD may become available. With these cameras one can do really serious, qualitative work at prices which are reasonably affordable for Western amateurs.

My personal goal in the coming years is to construct a large mobile telescope which will allow conventional photography with a relatively large field on the sky of 2 by 2 degrees as well as CCD imaging. It will be a 0.86 metre Newtonian f/3.4 telescope on a fork mounting with computer-controlled drive and positioning system. The telescope will be fully transportable and will be mounted on a trailer. With this instrument, which

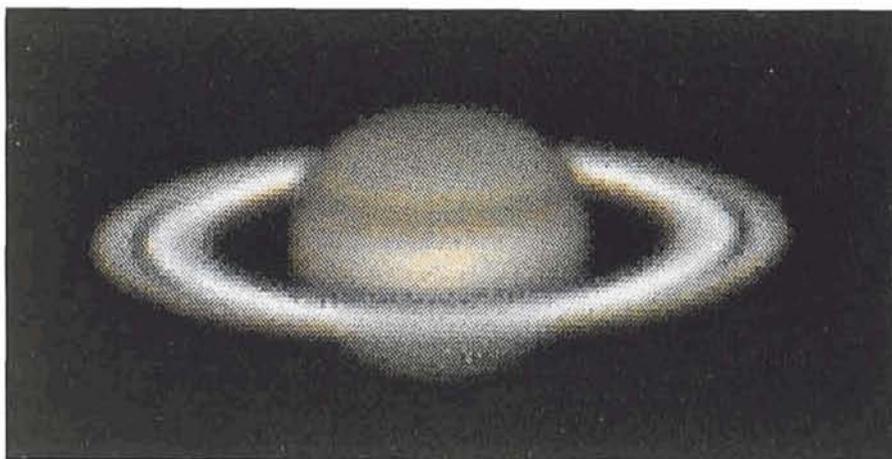


Figure 1: Comet P/Swift-Tuttle 1992t on October 30, 1992 at 17:55 UT, exposure: 300 sec; scale: 5 arcseconds per pixel; estimated total magnitude of coma: 7.2 mags.



Figure 2: Comet P/Swift-Tuttle 1992t on November 6, 1992 at 17:25 UT, exposure: 600sec; scale: 5 arcseconds per pixel; estimated total magnitude of coma: 6.5 mags. Both comet exposures were made through a 500-mm telephoto lens with f/8.0

Figure 3: Saturn on August 8, 1992 at 21:30 UT. Composite image of three single images made through Wratten filter 23A for red, 56 for green and 38A for blue light. Exposure time: 0.5 sec, 1 sec and 3 sec for red, green and blue light respectively. The seeing was mediocre (about 2 arcseconds) and the image was taken at the 1.06-m Newton telescope in Puimichel. ▶



is already under construction, I intend to travel to the best places for astronomy in the world, including northern Chile. This will obviously not be easy, but with the help of friends nothing is impossible.

"First light" for the new telescope will be in the first half of 1993. Maybe I will have the opportunity to inform the readers of *The Messenger* about the progress of this project and the results from the future observations.

I want to thank the *Messenger* editor,

who invited me to write about some aspects of CCD astronomy, as it is used by non-professionals. I also want to

thank the ESO Image Processing Group for preparing my images shown in the article.

## Development of ESO Publications

### Introduction

The readers of *The Messenger* are probably aware that ESO is one of the world's major astronomical institutes, and most of the readers also know that, apart from some advance information published in *The Messenger*, the results of the scientific research performed at ESO are published in the well-known astronomical journals like *Astronomy and Astrophysics*, *Monthly Notices*, *Astrophysical Journal*, etc.

But not so many people realize that, in addition to *The Messenger*, ESO produces many other publications as well and is also a registered "publishing house". The number of these publications and especially their volume has increased over the years, reflecting the increasing scientific and technical activities of this Organization. In this article, the development of ESO's main publications will be described – primarily with regard to the increase of pages from 1974 – the first year of service of the undersigned – to 1992. It would be too time-consuming to compare the page numbers for each of these years. Therefore only the following four years – 1974, 1980, 1986 and 1992 – will be considered here. The six-year intervals have been randomly chosen, and there are certainly fluctuations from one year to the other between these reference years, but the general tendency is obvious: the number of ESO publications has been steadily increasing.

### Which Are These Publications?

The most important ESO publications are *The Messenger*, the Annual Report, the ESO Conference and Workshop Proceedings and the Scientific and Technical Preprints. Other series are the VLT Reports, the Scientific Reports, the Technical Reports, the ESO Users Manual, the Operating Manuals and the Maintenance Manuals. In addition to these series, ESO also publishes information material for PR purposes – e.g. press releases and posters – and, from time to time, books like "Evolution in the Universe", "The ESO/Uppsala Survey of the ESO (B) Atlas", "ESO's Early History", etc. The term "main" or "important" publication in this connection only refers to the effort and time required to prepare them for publication. It does not take into account the sometimes enormous efforts of the authors and other people involved (secretaries, photographers, draftsmen, etc.) to draft and type the manuscript and to provide the accompanying illustrations. Information leaflets, posters and similar material (though their preparation can be rather time-consuming) will not be included in this comparison. Their relatively small number of pages does not reflect the time involved and would not have much influence on the total number of pages given hereafter.

In the early years of ESO there existed two other series whose publication was discontinued in the 1970s: *The ESO Bul-*

*letin* and the *Communications of the European Southern Observatory*. The former mostly contained information of a more technical nature like reports on instrumentation or meteorological reports, and the latter consisted of reprints of articles published in the scientific journals by ESO researchers.

### The Messenger

*The Messenger* was launched in May 1974 by Prof. A. Blaauw (then Director General of ESO) in order "... to promote the participation of ESO staff in what goes on in the Organization, especially at places of duty other than our own. Moreover, *The Messenger* may give the world outside some impression of what happens inside ESO..." It may be useful to remind the reader that in 1974 the ESO Headquarters in Garching did not yet exist and that the European activities of ESO were dispersed over Hamburg (Office of the Director General and Administration) and Geneva (Telescope Project Division and Sky Atlas Laboratory).

The first issue of *The Messenger* had six pages, the one of December 1992, 88 – the record so far attained. The circulation at the beginning was about 1000 copies, today it is 4200, with new subscriptions being opened almost every day. If we except the first three issues, until now two editors have been responsible for the journal, Dr. R. M. West and Dr. P. Véron. *The Messenger*