The first version of the FITS Liberator software was released on the 8th July 2004 and since then more than 50,000 people worldwide have looked over the scientists’ shoulders and worked with digital images from telescopes in space and on the ground themselves. In this way the Liberator has become the 'industry standard' for the production of astronomical colour images. The new version 2 of the software has recently been released and opens up a significant number of new possibilities.

The coming of the digital age in the 1980s changed the workflow patterns in astronomy for ever. The transition from photographic glass plates and films inside the instruments to electronic CCDs (Charge Coupled Devices) meant that astronomical images changed from analogue to digital in the space of a few years.

The access to digital observations from the many different telescopes around the world partly improved the quality of the measurements themselves and partly simplified the astronomers’ workflow when analysing the information from remote stars and galaxies. Digital images exist as numbers that can be handled directly by a computer whereas the now historic photographic films had to go through a laborious digitisation process before they could be worked on. The ready availability of digital images had huge benefits and provided great flexibility in the work of analysing light and accessing quantitative measurables.

It is not well known that astronomical observations, for instance from the Spitzer Space Telescope and the Hubble Space Telescope, are freely available in large archives. In principle everyone has access to these enormous amounts of data, but for many years only astronomers have made use of this opportunity.

We all know the impressive—almost artistically beautiful—images from Hubble, Spitzer and Chandra and other professional telescopes. For many years it has taken a considerable amount of expert knowledge to retrieve the raw exposures, reduce them to remove artefacts etc., not to mention process them to turn them into beautiful representative colour images. With the freely available ESA/ESO/NASA Photoshop FITS Liberator software - now just out in version 2.1 -all this has changed. All inter-
ested amateur astronomers and lay people, now have easier access to, and can exploit, huge databases filled with images that are not only packed with information, but beautiful too. The software is not meant to run as a stand-alone but is a supplement to the commercial image processing software Adobe Photoshop® (as a so-called plug-in).

The somewhat curious name, FITS Liberator, arose from the FITS (Flexible Image Transport System) file format that has been a standard for most astronomical observations since 1982, and is indeed very flexible, but also rather technically advanced and so inaccessible to ‘normal people’. FITS files come in numerous different shapes and sizes and to ‘free’ them and make them accessible to non-astronomers requires a piece of specialised software like the Liberator that can take a huge number of special cases into consideration. Before the Liberator only professional astronomical image processing software could open and process FITS files, which made them more or less unusable for lay people.

The FITS format is, as already mentioned, not the easiest to work with and it has taken the team much work to crack the many nuts along the way to make the extensive programme with 20,000 lines of code functional.

Somewhat surprisingly the software turned out to be a huge success right from the first version released in July 2004 and within the first year more than 50,000 people have started using it. Many different kinds of people use the FITS Liberator. There are naturally many amateur astronomers who either have a telescope in their backyard.

Figure 1: A screenshot of the FITS Liberator user interface.
or who would like to roam the professional data archives themselves. Some educators also use the software and quite a lot of curious youngsters have become ‘FITS Liberators’. In the coming years some attention will be focused on making the enormous data archives from, for instance, the Spitzer and Hubble Space Telescopes, as well as ground-based archives such as the European Southern Observatory’s Very Large Telescope (VLT), more accessible under the auspices of the international Virtual Observatory collaborations. Already many astronomical archives today deliver so-called “science-ready” products, i.e. relatively clean images where the artificial ‘fingerprints’ from telescope, optics, and detectors have been removed. The stage then is already set to combine them and turn them into spectacular colour images.

As the Liberator developed we have had to define new workflows and principles for producing attractive astronomical images from start to finish. It has been a great adventure to pioneer the future of pretty astronomical pictures. Most of us have grown up with posters of beautiful nebulae and galaxies on our walls. These images were created using photographic methods in the darkrooms of the ‘real’ pioneers, such as the legendary David Malin in Australia. There is no doubt that the darkroom and the enlarger are far slower and more demanding tools and that these early results should command a great deal of respect. The new digital workflow makes it a lot easier to achieve beautiful results and opens the doors to everyone. As always new technology creates new horizons for the old as the revival of the old Schmidt glass plates seen here illustrates.

FITS Liberator can be downloaded for free from: http://www.spacetelescope.org/projects/fits_liberator/

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- **Development Lead**: Lars Holm Nielsen
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- **Scientific support**: Robert Hurt
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Figure 1. It is now possible to compose beautiful colour images in a simple way from all telescopes, both on the ground and in space. What could be more “old school” than creating images from data from scanned glass plates from the period between the fifties and the nineties? This is what amateur astronomer Davide de Martin has done with extraordinary results. Credit: Davide De Martin (http://www.skyfactory.org/) & Digitized Sky Survey 2