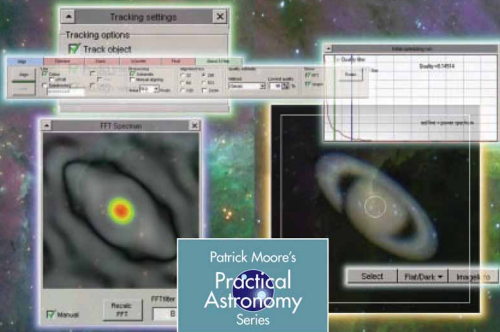


Grant Privett

Creating and Enhancing Digital Astro Images



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Images**



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*What one fool can do, another can.
Ancient proverb*

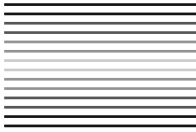


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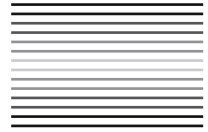
Once more, I owe a great debt to Rachel without whose unfailing support this book would never have appeared. As before, she put up with the late nights, my interminable moans about the clouds and the fact that the DIY just didn't get done. It will now, I promise.

In addition, I would like to thank the many astro-imagers who so generously allowed me to use their images to illustrate the examples of image processing herein. I owe each of you an inordinately large beer. Anyone seeking details of the equipment and techniques they use to take such fine images need look no further than Chap. 15: "Notes on Image Contributors", where you will find the URLs for some spectacularly illustrated websites.

I would like to extend my thanks and gratitude to David Woodward, Kev Wildgoose, Mark Wiggin and John Watson who were brave enough to read the early drafts, identify omissions and provide many useful suggestions for improvements.



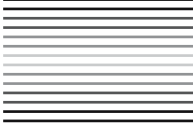
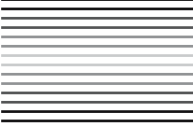

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The Joy of Image Processing

So, what is image processing? Well, at its most basic, it's the gentle art of manipulating a digital image to show its content to the best possible or desired effect.

Obviously, the effect you require from your images will vary from night to night. On one night you may be trying to determine the magnitude of the faintest star you can image, on another the emphasis may be on picking out delicate areas of nebulosity around the Pleiades, while on still another, you might be striving to record detail on a Jovian moon.

All are examples of astronomical imaging, yet each requires the use of a distinctly different approach; both to the imaging process and the subsequent image processing you apply. This is to some extent true for normal day-to-day photography, but where astronomical image processing differs from the handling of holiday snapshots is that some essential processing stages *must* be undertaken for every image. Whether you take your images with a purely scientific or aesthetic objective in mind, these crucial processes must be performed for the best possible image to be created. For the subsequent processing stages, the techniques used are frequently a matter of choice or taste and the rules about their application more arbitrary. The essential stages are referred to as “image/data reduction” while the later stages are generally described as “image enhancement”.

In many ways the image reduction process is relatively straightforward and routine, and it is mainly the diverse range of image enhancement possibilities that leads to the tendency for amateur astronomers to reprocess their previously taken images as they become more practiced and their expertise grows. The practice of returning to old images is often quite educational and also has the virtue of making even a cloudy night bearable.

This book will lead you through both stages of image processing while explaining the concepts involved through clearly illustrated examples rather than through a mass of bewildering equations. For those of you keen to go deeper into the

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mathematical details lurking tantalizingly behind your computer's graphical user interface (GUI), a number of references are identified as sources of useful further reading.

The equipment essential for undertaking image processing are a computer, some image processing software and a digital camera of some form; be it a charge-coupled device (CCD), webcam or digital single-lens reflex camera (DSLR). To make selecting a sensor a little easier, the early chapters discuss their relative merits and limitations. No sensor is perfect for every task and there is always an element of horses-for-courses involved. Observers who have previously been active astro-photographers using film and slides can create digital images from their slides, prints or negatives using scanners. They will also be delighted to find that work at a PC may bring new life to old images.

On the subject of software this book is deliberately non-committal as many programs exist to do image processing and image reduction, and, frankly, none are perfect and those that approach it are clearly overpriced at present. Consequently, the book normally discusses the principles involved rather than the detail of any given software. The book does provide a list of useful and popular software that is well worth a look.

The other requirement – the most important thing – is a willingness to learn, and the endurance to keep on nagging away at a problem until it is sorted out. Some of the concepts in image processing can be a little confusing, but with familiarity the confusion gradually wears off and things start to make more sense.



Figure 1.1. An SBIG ST7-MXE CCD camera. In this case it is shown fitted with a standard camera lens. The ST7 camera has been around for some years, but upgrades to the chip sensitivity and the connection type to the computer – in this case USB – mean this remains a popular camera. Image credit: Santa Barbara Instruments Group.