



Preface

For more than a century and a half, astrophotography has consistently brought us vital information about our universe as well as the visual splendor of the cosmos. By way of an amazingly rich journey and through the contributions of many individuals, we have now arrived at an era where astrophotography serves as both art and science. Along the way, we have learned that art and science are not mutually exclusive objectives but together can serve the human need to learn about our place in the universe and to experience and enjoy nature on the grandest of scales.

The process of astrophotography has transitioned over time from a purely technical exercise with a defined scientific and informational purpose to an increasingly human experience where the skillful management of light and color can reconstruct powerful cosmic scenes that reach out to us and enrich our understanding and appreciation of nature on many levels. The process has become increasingly personal in a sense. A given astronomical data set can produce many different results, each one valid, and each a reflection of the eye and imagination of the individual.

Mechanically speaking, astrophotography is fundamentally a two-step process. The two processes could not be more dissimilar. The first step of data acquisition requires the precise functioning of the equipment chain. The mechanics of light collection leave little room for error. Image acquisition is dogmatic and rigid by necessity, and imposes strict rules and limits. However, the second step of image assembly and enhancement is, on the contrary, an entirely fluid process. It requires a creative and flexible mindset, and demands experimentation in order to succeed. It is truly a dynamic and creative process.

This book is more about the second step of the process. Since I began astrophotography, it is this phase of the process which I have found to be the most personally rewarding and enjoyable. People often ask me how to produce images with high visual impact. I tell them the most essential element is to view and experience as

many astronomical images as possible and emulate the ones you admire most. Only in this way can one's own photographic eye and sense of style develop and mature. Programs such as Photoshop, as wonderful as they are, can only provide the raw tools. The road to good results can only be achieved by studying the works of others and ultimately tapping into that experience to carve out your own style and direction.

The organization and objectives of this book are based on my experience as a student of astrophotography, of which I remain and will forever be. Since the advent of the CCD camera and the subsequent birth of digital astrophotography, modern astronomical imaging has become increasingly diverse and rich. In the last decade, the craft has grown exponentially, resulting in a myriad of different applications and subdisciplines. Astrophotographers today possess the technical resources to record the faintest objects from the depths of space, the finest details of the Sun, the Moon, and planets, and the sublime beauty of the local night sky here on Earth.

Certainly, technical advancements in telescope and camera technology were critical in propelling astrophotography into the modern era. Nevertheless, the final outcome of the astrophotographic process rests on the imager's ability to assemble the astronomical data into a coherent image with maximal visual and informational impact. The creative aspect of the craft is increasingly driven and defined by the successful management and enhancement of data after it is collected at the telescope. Today, the measure of success of an astronomical image is increasingly dependent on the image-processing skills and creative vision of the astrophotographer. The modern practitioner of astrophotography cannot only be proficient at taking images but must stay current with the growing array of sophisticated digital techniques used to extract the finest details, the richest colors, and the faintest signal from his or her data.

Consequently, the mastering of astronomical image processing has become the essential task for the modern astrophotographer. As techniques and methods expand and evolve at an ever-increasing pace, staying current with the latest information has become the primary mission of the dedicated imager. Yet, the delivery of that information has become challenging. There are no formal university courses, apprenticeships, or degrees in astrophotography. As a result, astronomical imagers have become a self-taught breed relying predominantly on a combination of field experience, web-based resources, and informal instruction to learn the vast nuances of this extraordinarily complex and challenging craft. There exists today a paucity of books on astronomical image processing primarily because it is impossible for one author to cover the full range of subject areas with the expert precision each area deserves.

This book – by its very nature, a collection of works by individual contributors, each distinguished in their particular areas – will attempt to accomplish this task by covering in systematic detail each of the major subdisciplines of astrophotography. This approach offers the reader the greatest opportunity to learn the most current information and the latest techniques directly from the world's foremost innovators in the field today. Each chapter covers the specific processing techniques, methods, and strategies unique to each of the major subdisciplines of astrophotography. A large portion of the book is devoted to “deep sky imaging” since it represents the

foundation of astrophotography. Individual chapters cover specific challenges within the realm of “deep sky imaging,” such as bringing out faint structure, enhancing small- and large-scale detail, noise reduction, and narrowband imaging. To add some practical elements to the instruction and ensure that all pertinent subject matter is covered, I asked three world-renowned imagers to write chapters in which they describe their preferred “deep sky” workflows in step-by-step detail.

The information in the pages ahead may not answer every processing question that arises, but it will provide the reader with the necessary skills and strategies for successful high-level imaging. The collective input from multiple contributors, all with different perspectives and experience, is extraordinarily valuable but also increases the chance that there may be some overlap in the information delivered. In this sense, overlap is a good thing. Some redundancy reassures and confirms that certain methods are more time proven than others. The field of astronomical image processing is not a static one, but a markedly fluid and ever-evolving craft. The challenge of trying to cover the most current material in a rapidly changing field is similar to chasing a moving target. Nevertheless, the pages ahead should offer the reader a strong foundation of skills and knowledge to build on for years to come.

For many, astrophotography is an adventure of the mind, heart, and spirit. It is a difficult and demanding journey, but one that pays back immensely and offers an unparalleled sense of discovery. The objective of this book is to provide guidance to those individuals who want to take this amazing journey themselves. They want to learn the powerful tools and techniques of image processing so they, too, can experience the joy and wonder of astrophotography. It is my hope that the pages ahead will provide motivated imagers with the necessary tools, techniques, and strategies to help them find their own path and direction in astronomical imaging.

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Lessons from the Masters

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