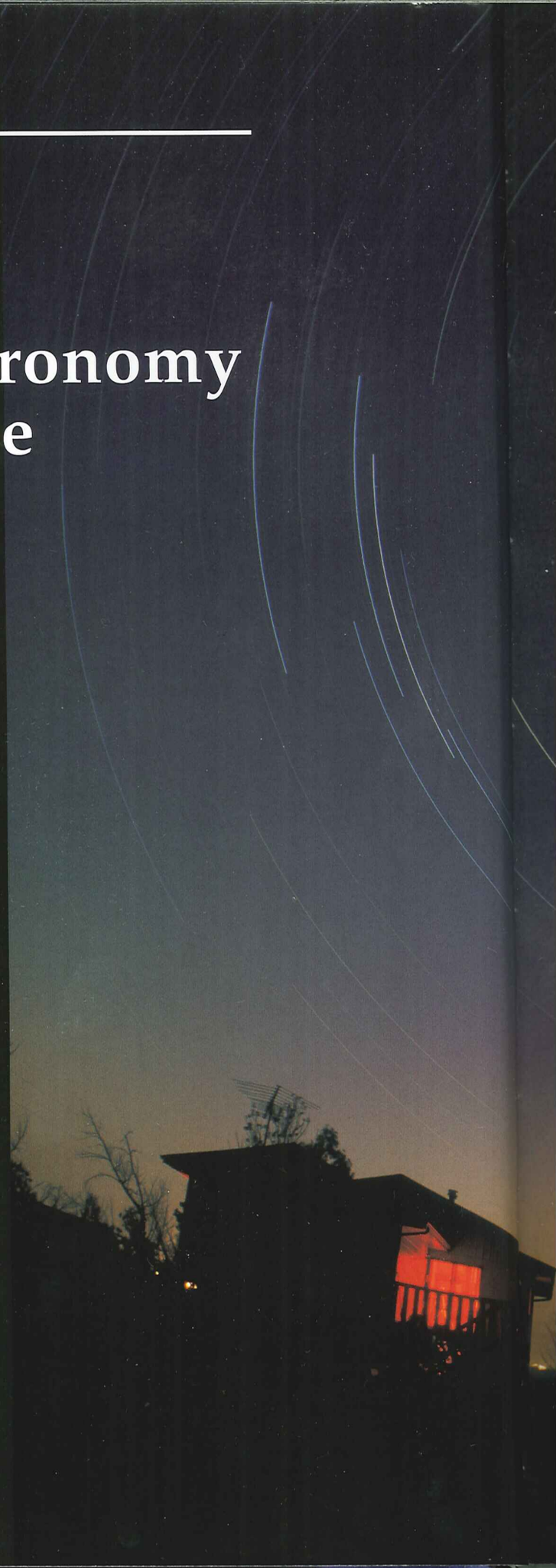
CHAPTER ONE

Amateur Astronomy Comes of Age

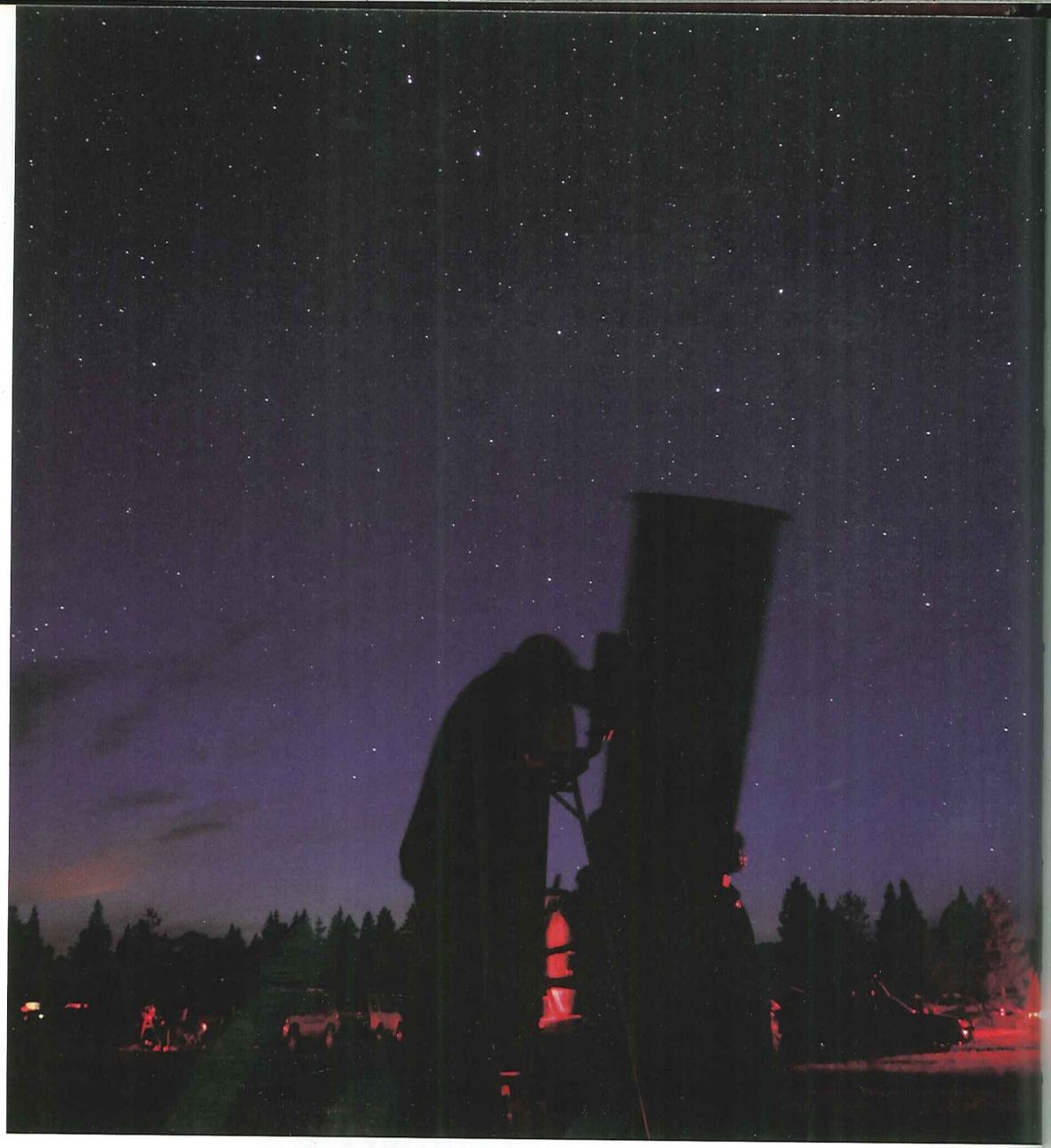
There is something deeply compelling about the starry night sky. Those fragile flickering points of light in the blackness beckon to the inquisitive mind. So it was in antiquity, and so it remains today.

Only in the past two decades or so, however, have large numbers of people chosen to delve into stargazing—recreational astronomy—as a leisure activity. Today, more than half a million people in North America call themselves amateur astronomers.

The magic moment when you know you're hooked usually comes with your eye at a telescope eyepiece. It often takes just one exposure to Saturn's stunningly alien, yet serenely beautiful ring system or a steady view of an ancient lunar crater frozen in time on the edge of a rumpled, airless plain.



The stars wheeling overhead at night beckon backyard astronomers outside for a personal exploration of the cosmos, whether from an urban home or a rural retreat away from city lights. Time-exposure photo by Alan Dyer.



Wait Until Dark ▶
The twilight colors are fading, the sky is growing darker, and the telescope is beginning its task of revealing celestial wonders at a woodland campsite. Just when most people are retreating inside, recreational astronomers are gearing up for hours of exploration under the stars. Once the pursuit of an eccentric few, astronomy is now the pastime of people of all ages. Photo by Alan Dyer.

Naturalists of the Night

American 19th-century poet and essayist Ralph Waldo Emerson once wrote: "The man on the street does not know a star in the sky." Of course, he was right then and now. Well, almost. In recent years, a growing number of people want to become acquainted with the stars. Sales of astronomy books, telescopes and astronomy software have reached all-time highs. More people than ever before are enrolling in the astronomy courses offered by colleges, universities and planetariums. Summer weekend gatherings of astronomy enthusiasts for telescope viewing and informative talks (known among the participants as "star parties") now attract thousands of fans. There is no mistaking the signals: Astronomy has come of age as a mainstream interest and recreational activity.

Not coincidentally, the growth of interest in astronomy has paralleled the rise in our awareness of the environment. The realization that we live on a planet with finite resources and dwindling access to wilderness areas has generated a sharp increase in activities which involve observing and appreciating nature: birding, nature walks, hiking, scenic drives, camping and nature photography. Recreational astronomy is in this category

too. Amateur astronomers are naturalists of the night, captivated by the mystique of the vast universe that is accessible only under a dark sky.

In recent decades, the darkness that astronomy enthusiasts seek has been beaten back by the ever-growing domes of artificial light over cities and towns and by the increased use of security lighting everywhere. In many places, the luster of the Milky Way arching across a star-studded sky has been obliterated forever. Yet amateur astronomy flourishes as never before. Why? Perhaps it is an example of that well-known human tendency to ignore the historic or acclaimed tourist sights in one's own neighborhood while attempting to see everything when traveling to distant lands. Most people now perceive a starry sky as foreign and enchanting rather than something that can be seen from any sidewalk, as it was when our grandparents were young.

That is certainly part of the answer, but consider how amateur astronomy has changed in two generations. The typical 1960s amateur astronomer was usually male and a loner, with a strong interest in physics, mathematics and optics. In high school, he spent his weekends grinding a 6-inch f/8 Newtonian telescope mirror from a kit sold by Edmund Scientific, in accordance with the instructions in *Scientific American* telescope-making books. The four-foot-long telescope was mounted on what was affectionately called a plumber's nightmare—an equatorial mount made of pipe fittings. In some cases, it was necessary to keep the telescope out of sight to be brought out only under cover of darkness to avoid derisive commentary from the neighbors.

Practical reference material was almost nonexistent in the 1960s. Most of what there was came from England, and virtually all of it was written by one man, Patrick Moore. Amateur astronomy was like a secret religion—so secret, it was almost unknown.

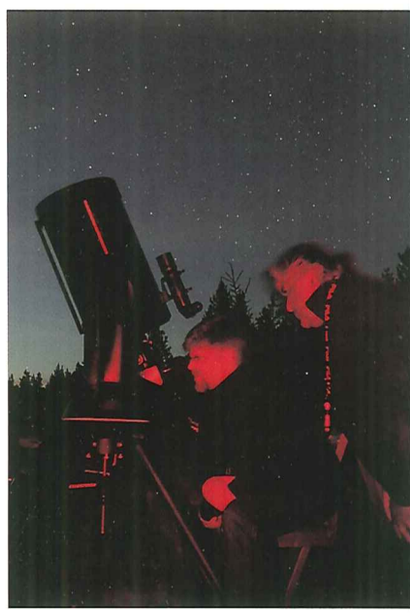
Thankfully, that is all history. Current astronomy hobbyists represent a complete cross section of society, encompassing men and women of all ages, occupations and levels of education. Amateur astronomy has finally come into its own as a legitimate recreational activity, not the pastime of perceived lab-coated rocket scientists and oddballs. Indeed, it has emerged as a leisure activity with a certain prestige. Unlike some hobbies, it is not possible to buy your way into astronomy. Astronomical knowledge and experience take time to accumulate. But be forewarned: Once you gain that knowledge and experience, astronomy can be addictive.

▲ **Star-Formation Nebula** At a distance of 5,000 light-years, the Lagoon Nebula is faintly visible to the naked eye and easy in binoculars. Photo by Alan Dyer.

AMATEUR ASTRONOMY TODAY

Amateur astronomy has become incredibly diversified. No individual can master the field entirely. It is simply too large; it has too many activities and choices. In general, though, amateur astronomers divide fairly easily into three groups: the observers, the techno-enthusiasts and the armchair astronomers. The last category refers to people who pursue the hobby mainly vicariously —through books, magazines, lectures, discussion groups or conversations with other aficionados. Armchair astronomers are often self-taught experts on nonobservational aspects of the subject, such as cosmology or astronomical history.

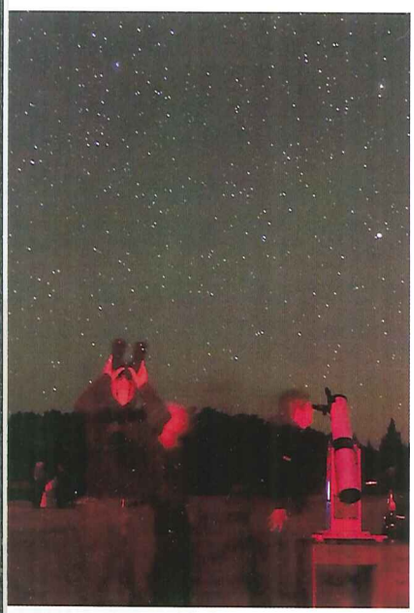
The techno-enthusiast category includes telescope makers and those fascinated by the technical side of the hobby, especially the application of computers to astronomical imaging and telescope use and the application of technological innovations related to amateur-astronomy equipment. It can also involve crafting optics, though this type of telescope making is less prevalent than



▼ **Sharing the Sky** Although traditionally a lone pursuit, amateur astronomy is now more often enjoyed together by families and friends.

Red-Light District ▶
Amateur astronomy has few regulations and little formality, but show up at a star party like this with white lights blaring, and you'll be in for a rude greeting. To preserve night vision, red lights are the rule. The Texas Star Party near Fort Davis (right) is one of the meccas of amateur astronomy. Photo by Alan Dyer.

Looking Up ▼
While a special event such as a comet can awaken a latent interest, the sky presents us with something new and wonderful to see every night.



it was a few decades ago. With the vast array of commercial equipment available today, "rolling your own" is not the common activity it once was.

This book is written primarily for the third kind of amateur astronomer, the observer, one whose dominant interest in astronomy is to explore the visible universe with eye and telescope. Observing, we believe, is what it is all about. The exhilaration of exploring the sky, of seeing for yourself the remote planets, galaxies, clusters and nebulas—real objects of enormous dimensions at immense distances—is the essence of backyard astronomy.

GETTING IN DEEPER

Amateur astronomy can range from an occasional pleasant diversion to a full-time obsession. Some amateur astronomers spend more time and energy on the hobby than do all but the most dedicated research astronomers at mountaintop observatories. Such "professional amateurs" are the exception, but they are, indeed, the true amateur astronomers—that is, they have selected an area which professional astronomers, either by choice or through lack of human resources, have neglected. They are, in the purest sense, amateurs: unpaid researchers.

In the past, such impassioned individuals were often independently wealthy and able to devote much time and effort to a single-minded pursuit. This is seldom the case anymore. For instance, Australian Robert Evans is a pastor of three churches, has a family with four daughters and is by no means a man of wealth or leisure. Yet he has spent almost every clear night since 1980 searching for supernovas in galaxies up to 100 million light-years away. He discovered 18 within a decade—more than were found during the same period by a team of university researchers using equipment designed exclusively for that purpose.

Similarly, most bright comets in recent years have been found by committed amateur astronomers. However, the persistent supernova or comet hunter represents just a tiny fraction of those who call themselves amateur astronomers. The vast majority —at least 99 percent—are more accurately described as recreational backyard astronomers. Although this term has not gained

wide usage, it more precisely describes what most amateur astronomers do. They are out enjoying themselves under the stars, engaging in a personal exploration of the universe that has no scientific purpose beyond self-edification. It's challenging and fun.

Backyard astronomy was neatly summed up a few years ago in *Astro Notes*, the newsletter of the Ottawa Centre of The Royal Astronomical Society of Canada: "The objective is to explore strange new phenomena, to seek out new celestial objects and new nebulosities, to boldly look where no human has looked before... and mainly to have fun."

Tom Williams, a chemist by profession and an astronomy hobbyist from Houston, Texas, has taken an interest in the distinction between the vast majority of casual stargazers and the handful of scientific amateurs. Williams points out some parallels with ornithology: "There are 15 million bird watchers in North America, but they call themselves birders, not amateur ornithologists. The real amateur ornithologists are the few thousand people involved in migration analyses, and so on." Similarly, he notes, "Of the 500,000 astronomy hobbyists, the same small percentage are scientific amateur astronomers who contribute in some way to research. The rest are recreational astronomers. The majority are in these activities for pure enjoyment, nothing more." The somewhat confusing aspect is that both groups—the scientific amateurs and the recreational amateurs—call themselves the same thing: amateur astronomers.

That is not to say there is no place for systematic and potentially scientifically valuable observing. Quite the contrary. But it is not every backyard astronomer's duty. Some choose to take a more rigorous approach to the hobby; most do not. Our book is dedicated to the latter group.

▲ **Shock Wave of Star-Stuff** Backyard telescopes can show us objects such as the Veil Nebula, blown into space by a supernova explosion. While a long-exposure photo reveals stunning colors, most such objects are subtle ghostly glows to the eye. The real thrill comes in knowing the true nature of celestial targets you can find and view for yourself. Photo and eyepiece simulation (inset) by Alan Dyer.

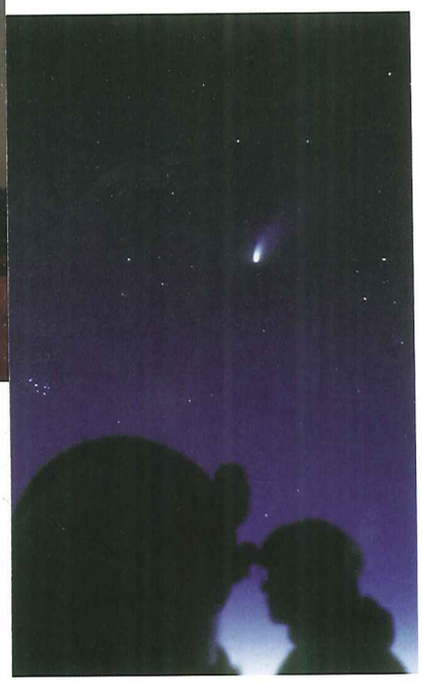
REACHING FOR THE STARS

Some of the activities of astronomy buffs totally baffle those not afflicted with the bug. Take the arrival of Comet West, for instance, one of the brightest comets visible from midnorthern latitudes in the past century. Comet West was at its best in early March 1976, but the weather over much of North America was terrible. Astronomy addicts were having severe withdrawal symptoms as they stared at the clouds each night, knowing that the comet was out there, just beyond reach. In Vancouver, several young enthusiasts decided that they had had enough. "The comet was peaking in brightness. We had to do something," recalls Ken Hewitt-White, then a producer at Vancouver's MacMillan Planetarium and

◀ **Aware of the Night** You know you are an amateur astronomer when, upon stepping outside at night, you automatically look up just to see what the sky contains. In this case, the distinctive constellation Orion greets the observer in a moonlit evening sky. Photo by Terence Dickinson.

Sky Fire ▶
A bright, rippling aurora, pulsing in shades of green and red, is one of the sky's most memorable shows. It ranks an 8 on our 1-to-10 scale of sky sights. Photo by Terence Dickinson.

Just Passing Through ▼
When something rare appears overhead, like a bright comet, public interest soars, and even hardened amateur astronomers have been known to go a little crazy, especially if clouds threaten to rob them of the opportunity for a once-in-a-lifetime view. Photo of Comet Hale-Bopp by Ken Hewitt-White.



the mastermind of the Great Comet Chase.

They rented a van and began driving inland over the mountains, which the forecast predicted would be clear of cloud cover by 4:30 a.m., the time when the comet was to be in view. The outlook for Vancouver was continued rain. "There were five of us with our telescopes, cameras and binoculars all packed in the van," says Hewitt-White. "A sixth member of our group had to get up early for work and reluctantly stayed behind.

"It was a nightmare from the start—a blinding snowstorm. 'It's got to clear up,' we told each other. We drove 200 miles, and it was still snowing. After a few close calls on the treacherous mountain road, we finally turned back. Then, as we crossed the high point in the Coast Mountains, the sky miraculously began to clear. It was exactly 4:30. We pulled over and immediately got stuck. But we had not gone far enough—a mountain peak blocked the view.

"Five comet-crazed guys in running shoes started scrambling up the snowdrifts on the nearest cliff to gain altitude. By the time we reached a point where the comet should have been in view, twilight was too bright for us to see it. Half-frozen and dripping wet with snow, we pushed the van out and headed back to Vancouver. Within minutes, we drove out of the storm area and saw cloudless blue sky over the city. When we got home, we heard the worst: The guy who stayed behind had seen the comet from a park bench one block from his home."

The eclipse chasers, another subgroup of recreational astronomers, spend countless evenings planning every detail of an eclipse expedition—a trip, sometimes to remote regions of the globe, for the express purpose of standing in the Moon's shadow to watch a total eclipse of the Sun. Given the vagaries of the weather and the inevitable glitches in foreign countries, probably half of these pilgrimages are partial or complete failures. Ventures have been foiled by dust storms blowing away tents, lost luggage, broken-down rental cars and balky camera equipment.

Regardless of the outcome, though, as soon as they get home, the eclipse stalkers whip out maps and start planning the next year's expedition. For anyone who has not seen a total solar eclipse, the behavior may seem odd. But for veteran eclipse chaser Robert May of Scarborough, Ontario, it is

"the greatest of all natural spectacles, a truly awesome phenomenon. I want to see every one I can while I am still physically able to do so." May says that for him, eclipse chasing has added a new dimension and a real purpose to foreign travel.

ARE YOU READY?

As we said previously, astronomy is not an instant-gratification hobby. It takes time and effort to appreciate what you are looking at and to coax the best performance out of your telescope or binoculars. Moreover, backyard astronomers come to know how enjoyable it is to hear the "oohs" and "aahs" from people who are looking through a telescope for the first time. The ultimate thrill, though, is to be uttering the oohs and aahs yourself. With this in mind, we offer the backyard astronomer's Aah Factor, a 1-to-10 scale of celestial exclamation.

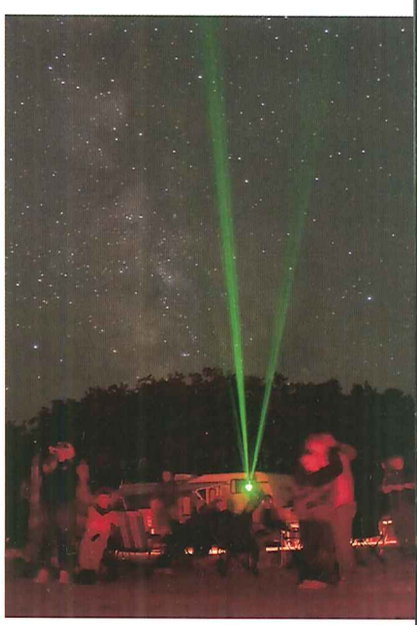
Factor 1 on the scale is a detectable smile, a mild ripple of satisfaction or contentment. Factor 10 is speechless rapture, an overwhelming rush of awe and astonishment. Here are a few examples to aid in developing your own Aah Factor list.

- One: Any routine celestial view through binoculars or a telescope; a faint meteor; a well-turned phrase in a good astronomy book.
- Two: Finding the planet Mercury; sunspots; the Moon's surface through a telescope; discovering how clear things look through binoculars mounted on a tripod; cloud belts on Jupiter.
- Three: Saturn or the Orion Nebula through a telescope, even if you have seen them umpteen times before; the starry dome on a clear, dark night in the country; Jupiter's Red Spot; a colored double star.
- Four: A beautiful sunset or sunrise; seeing a bright Earth satellite for the first time; a partial eclipse of the Moon; a close conjunction of two planets or of the Moon and Venus; Earthshine in binoculars; finding the Andromeda Galaxy for the first time.
- Five: Identifying Jupiter's moons through binoculars for the first time; a moderately bright comet in binoculars; telescopic detail on Mars; a meteor shower.
- Six: Recognizing your first constellation; a bright meteor; a good telescopic view of a galaxy or a globular cluster; the shadow of one of Jupiter's moons slowly crawling across the planet's face; your initial look at your first successful astrophoto.
- Seven: A first view of the Moon through a telescope; a first view of the Milky Way with binoculars; a total eclipse of the Moon; a bolide or a fireball meteor.
- Eight: A rare all-sky multicolored auroral display; the moment you begin to realize how immense the universe is.
- Nine: A bright comet with a naked-eye tail; your *first* view of Saturn's rings through a telescope; a meteor storm.
- Ten: A perfect view of a total eclipse of the Sun; discovering a comet or a nova.

It is nice to log a two or a three on the scale each night. Soon, you will be climbing the scale of celestial aahs. It is captivating and addictive. It can even get out of hand. For instance, one rabid enthusiast we know became physically ill while attending a concert with his wife and friends because he had noticed a spectacular aurora brewing when they were parking the car. He felt tortured by not seeing it but did not want to spoil the evening for the others. Such is the power of the night sky. How far you are taken by its spell depends on you.

Of course, there is always the frustration of being clouded out after preparing for an eclipse or other major celestial event for weeks—or even years. This is an activity with frustration minefields along with the rapture. It's not for everybody. But with the help of this book, you will soon know whether it's for you.

▲ **Camp Under the Stars**
No matter where you live, there's a star party near you, where families gather to enjoy the sky.



▲ **Star Tours**
A feature of many star parties now is a laser-guided beginners' tour of constellations and binocular targets, an ideal way to start your lifelong love of the night sky.