

A GOLDEN GUIDE

THE SKY OBSERVER'S GUIDE



Full-color, Easy-to-Use

THE SKY OBSERVER'S GUIDE

A HANDBOOK FOR
AMATEUR ASTRONOMERS

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GOLDEN PRESS • NEW YORK

Western Publishing Company, Inc.

Racine, Wisconsin

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SUN



MERCURY



VENUS



EARTH



MOON



MARS



JUPITER



SATURN



URANUS



NEPTUNE



PLUTO

Becoming a Sky Observer

All of us, from childhood, have gazed at the sky in wonder. Sun and Moon, the wandering planets, the fiery trails of comets and meteors—these are things to marvel at. Man will never tire of looking up into the tremendous, sparkling bowl of space.

Skywatching was undoubtedly a pastime of prehistoric man. The ancient Egyptians and Babylonians, several thousand years ago, observed the heavens carefully enough to devise quite accurate calendars. Observations by Copernicus, Galileo, and others in the sixteenth and seventeenth centuries were among the first great steps to modern science. Even today, the science of astronomy depends on observation.

ASTRONOMY FOR EVERYBODY Astronomy is for the amateur as well as the professional. The amateur can see for himself the sights that stirred Galileo, the Herschels, and other great astronomers. A high-school boy may be the first to see a comet, a rug salesman may discover a nova, and a housewife can observe and map meteor showers. An amateur's faithful observations of a variable star may be just the data an observatory needs.

Although in some regions weather and climate

Mars—a challenge to astronomers: This photo of the red planet, always a favorite of observers, is one of the finest. (W. S. Finsen, *Union Obs.*, Johannesburg)



look and what to look for. The constellations can be traced and identified. Some star clusters can be located, and eclipses and some comets observed. The changing positions of Sun, Moon, and the brighter planets can be closely watched, and some artificial satellites can be seen. The brightness and length of meteor trails can be estimated. Get used to finding your way about the sky with the eyes alone before trying a telescope.

BINOCULARS AND TELESCOPE Your first look at the heavens through good binoculars can be exciting. Binoculars with 50mm. lenses gather about 40 times as much light as the eye alone, revealing such features as mountains and craters of the Moon, sunspots, the four larger satellites of Jupiter, double stars and star clusters, and luminous clouds of cosmic gas such as the famous nebula in Orion. (Before observing ~~Sun~~, see pages 66-67!)

With no more than binoculars, some observers do useful scientific work, such as recording light changes in variable stars and watching for novas and comets. A telescope is obtained by every serious amateur sooner or later. Refractors, with lenses $1\frac{1}{2}$ to 4 inches diameter, and reflectors, with mirrors of 3 to 6 inches, are popular types. The light-gathering

Telescope on wheels: This home-made 8-inch reflector is kept in the garage and wheeled out at observing time. (William Miller)





For a serious amateur: This homemade 12-inch reflector, equipped with a camera, can give high performance. (Clarence P. Custer, M.D.)

lenses and mirrors, and design the mountings. It takes special knowledge and skill, yet hundreds of amateurs have made instruments that perform splendidly. Telescope-making classes are held at some planetariums, universities, and ~~observatories~~. Books on telescope making are available from booksellers.

ORGANIZATIONS OF AMATEURS Many amateur observers belong to national organizations. These give members information on equipment, observing techniques, and standard methods of reporting their work. They set up observing programs and receive observational data from members. Data are sent to observatories for use in programs of research. Some organizations publish news of developments that interest amateurs. Local groups observe together, compare equipment, and promote public interest in astronomy.

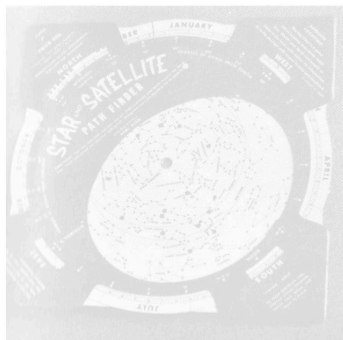
in a star atlas become indispensable. There are atlases of convenient size that show nearly all stars as faint as can be seen with binoculars. For serious work with a telescope, more detailed charts are needed.

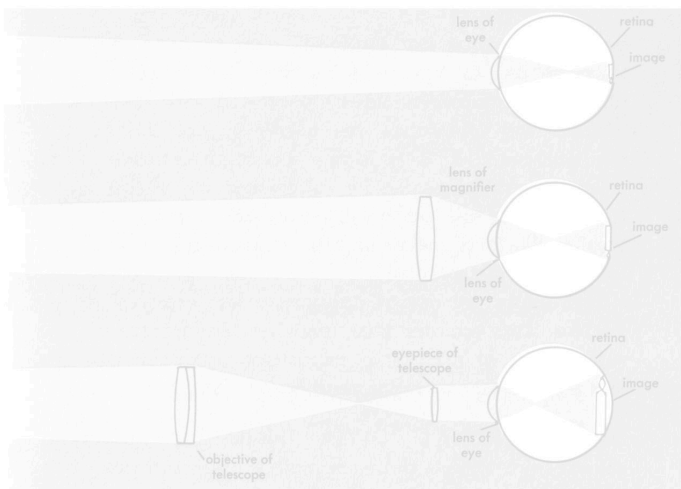
Some beginners use a planisphere to learn constellations. One type has a "wheel" on which is printed a map of the constellations. The wheel is rotated within an envelope that has a window. When the wheel is set for any particular month, day, and hour, the window shows the positions of the constellations at that time.

BINOCULAR FACTS Every observer should own a good pair of binoculars. These gather far more light than the eye; they magnify images and use the capacity of both eyes.

Opera-glass binoculars consist essentially of two small refracting telescopes mounted together. At the front of each is a large lens, the objective, which gathers the light. At the rear is a smaller lens, the eyepiece or ocular, which does the magnifying. In the front part of the eyepiece is a third element, the erecting lens, which is necessary to prevent our getting an upside-down view.

A planisphere, like this, is highly useful for learning the various constellations. Optical aid: Binoculars are useful for features and vast star fields. (Stellar)





Paths of Light through Magnifier and Telescope

TELESCOPE PRINCIPLES Astronomical telescopes are of two main types: refracting and reflecting

In a simple refractor, light is gathered by a lens, and magnification is done by the eyepiece. There is no erecting lens, because this would cut down the amount of light delivered to the eye. The image seen by the observer is inverted, but this makes no difference in observation of most celestial objects.

With the telescope the observer usually gets several removable eyepieces. These are used for different degrees of magnification, as desired.

Every good astronomical telescope has a finder—a small telescope, usually of 5 or 6 power, with a wide field, mounted on the main tube. It is used for aiming the telescope, because the field seen through a high-power telescope is very small. Astronomical refractors