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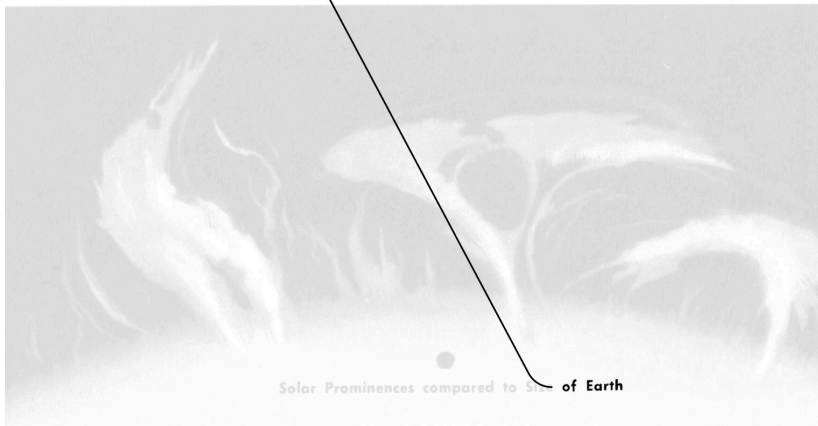
**WILDFLOWERS OF NORTH AMERICA**

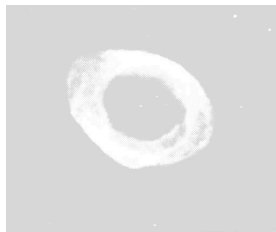
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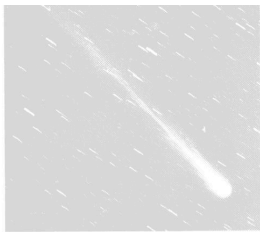
The maps on pages 148-157 were designed by R. Newton Mayall

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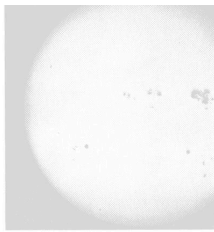




**Ring Nebula** (Mt. Wilson)

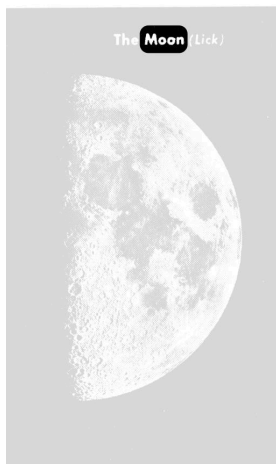


**Giacobini's Comet** (Yerkes)

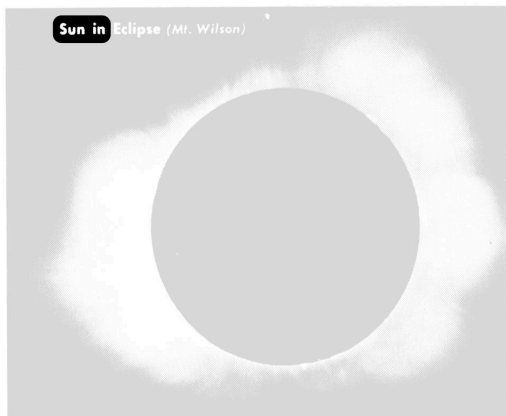


**Sun-spots** (Yerkes)

Some  
FAVORITE  
SKY OBJECTS  
For  
OBSERVATION

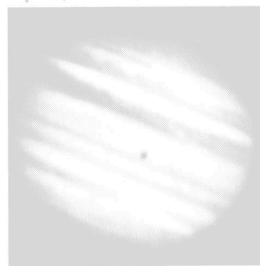


**The Moon** (Lick)



**Sun in Eclipse** (Mt. Wilson)

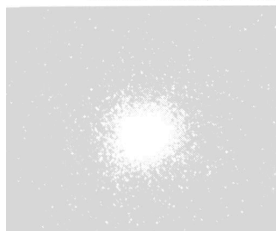
**Jupiter** (Mt. Wilson)



**Nova Herculis** (Yerkes)



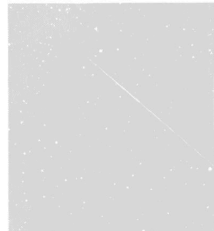
**Hercules Cluster** (Mt. Wilson)



**Orion Nebula** (Custer)



**A Meteor** (Yerkes)





**Great Nebula in Orion:** This famous object was painted as seen by the artist in his 8-inch telescope at 200 power. The pattern of four stars near the center is the well-known, colorful Trapezium.

are often unfavorable, any interested person in any part of the world can become a sky observer. The aspect of the sky differs from place to place, but the majesty of Sun and Moon, of stars and planets and nebulas, is to be seen everywhere.

This book is a guide to observing—to the use of binoculars and telescopes, the locating of sky objects, and what objects to look for and how best to see them. The beginning observer should have also a book on general astronomy. Even a little knowledge greatly increases the pleasure of observing, and it prepares us to undertake real astronomical projects. Most old hands have found that the fun of amateur astronomy is greatest when they are working on observation programs that are scientifically useful.

**OBSERVING WITH UNAIDED EYES** Even an observer without binoculars or a telescope can see many wonders of the heavens. The important thing is to know how to

and magnifying power of telescopes brings out details of the Moon's surface. It reveals Jupiter's larger satellites and its banded clouds, as well as markings on Mars and the rings of Saturn. With telescopes we can "split" double stars and distinguish star clusters, nebulae, comets, and sunspots. We can watch the Moon occult (that is, pass in front of) stars and planets. Light fluctuations of faint variable stars and novae can be detected.

Good small telescopes can give surprising performance. When conditions are right, an observer with a good 3-inch refractor or 6-inch reflector can see some features of Jupiter and Saturn more distinctly than they appear in observatory photographs.

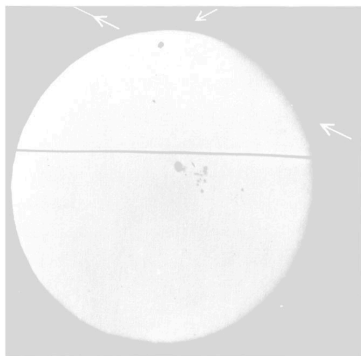
**FUN WITH THE CAMERA** Many amateurs make use of the camera. The eye is sensitive only to the light it is receiving in the present instant, but photographic film is sensitive to light received over a long period of exposure. An amateur's camera can detect faint objects which the eye, even with the aid of a telescope, could

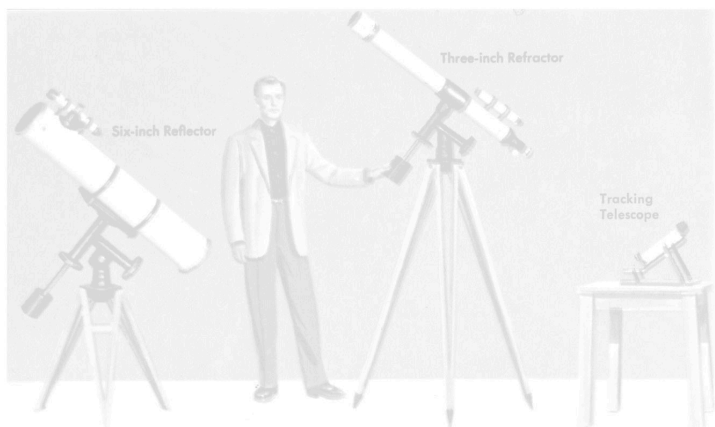
never see. Even a simple camera gives exciting and useful results.

## MAKING A TELESCOPE

Some serious amateurs, not content with factory-made telescopes, make their own. They find the

Transit of Mercury, Nov. 14, 1907: The movement of a planet across the Sun's disk is a rare sight. Arrows point to Mercury and show the direction of its path. (Yerkes Obs.)





**Three types of telescope:** The reflector, with a mirror for its objective, is a common all-purpose design. The refractor, using a lens for the objective, also is an all-purpose type. The tracking telescope has the extra-wide field needed for fast-moving objects.

## The Observer's Equipment

**CHARTS AND BOOKS** Just as we gather a supply of maps and booklets before touring the country, so we must gather certain sources of information before touring the sky.

This book provides all necessary information for a good start in sky observing. The index will guide you to explanations of observing techniques and equipment, to lists of interesting objects to look for, and to tables indicating where and when to look for planets, eclipses, meteor showers, and periodic comets. For more background in astronomy, the reader may turn to books and periodicals recommended on pages 146-147.

Hundreds of stars, nebulae, and other objects can be located with the aid of the maps on pages 148-157. For fainter objects the more detailed charts to be found

In the large prism binoculars, the objectives are centered farther apart. The light rays from them must be brought closer together before they reach the eyepieces. This is done by a pair of prisms in each tube.

Opera glasses have objectives of about one inch diameter and a magnifying power of 2 to 3. Prism binoculars, with their larger objectives and higher magnification, are preferable for astronomical observing. Popular types have objectives of 35 to 50 millimeters (about 1½ to 2 inches), and magnify 6 to 10 times.

Binoculars labeled "7×50" magnify 7 times and have an objective 50 millimeters in diameter. The area of the objective determines light-gathering ability; so 7×50 binoculars gather more than 7×35's.

Binoculars vary also as to field of view. The field is the whole circular area we see through the instrument. Thus in binoculars with a 6° field we can see an area of sky 6° in diameter—equal to an area 100 feet in diameter at 1,000 feet.

Heavy binoculars make the arms tired and unsteady. The magnification increases the effect of unsteadiness. Usually 7-power glasses are the limit for ease in handling. ~~Bigger eyepieces~~ require a support.

Magnification: large and reduced sizes of this photo show the Moon as seen with unaided eye and through 7-power binoculars. (Lick Obs.)



generally have a star diagonal, also, to bend the light at right angles before it reaches the eyepiece. This allows us to observe objects overhead with comfort.

Reflecting telescopes use a mirror, not a lens, for the objective. It is a highly polished concave glass disk coated usually with aluminum or silver. Light from the star falls upon this mirror and is reflected to a smaller diagonal mirror or prism in the tube. This reflects the light to the eyepiece.

Refractors get out of adjustment less easily than reflectors. Less maintenance, such as realignment or the resurfacing of mirrors, is necessary. But reflectors are less expensive and more readily made by amateurs.

**LIGHT-GATHERING POWER** The telescope's ability to reveal faint objects depends mainly upon the size of its objective. A lens or mirror 3 inches in diameter will gather two times as much light as a 2-inch, and a 6-inch will gather four times as much as a 3-inch. Figures given in the table here are only approximate. Some telescopes can do better. Actual performance depends partly upon seeing conditions, quality of the instrument, and the observer's vision.

**HOW SIZE OF OBJECTIVE DETERMINES  
VISIBILITY OF OBJECTS**

Diameter of Objective (inches)	Faintest Magnitude* Visible	Number of Stars Visible
1	9	117,000
1¾	10	324,000
2¾	11	870,000
4½	12	2,270,000
7	13	5,700,000
11	14	13,800,000
12½	15	32,000,000

\*See pages 26-27 for explanation of magnitude.