Celestron®

Schmidt-Cassegrain TELESCOPES

Celestron 14 *Celestron 5* *Celestron 8*

Truly Scientific Instruments at Popular Prices

The number one choice the world over . . . the most coveted, most recommended telescopes today among serious amateur astronomers, professors of astronomy and planetarium educators. These telescopes feature the Schmidt-Cassegrain optical system that produces brilliant, razor-sharp images over a wide flat field, and optically folds the performance of a massive observatory instrument into a compact portable. Whether you're considering your first telescope for casual observing, nature studies or telephotography . . . whether you're a 12-year-old junior scientist, an advanced amateur astrophotographer or a professional educator — a Celestron Telescope or equipment group is your optimum choice. We offer a complete line of instruments and accessories — a fully integrated system that challenges you to take part in an endless procession of educational experiments and rewarding adventures.

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GC 74-6 — Effective June 1974. Prices subject to change without notice.

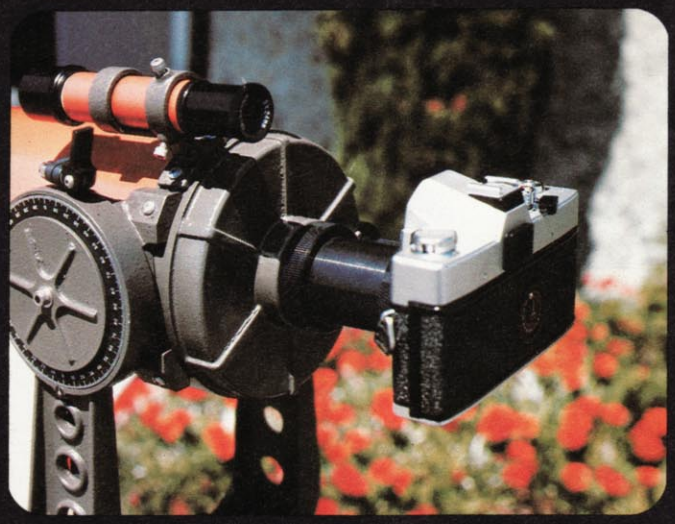
Celestron® 5

For the Casual Observer
Nature Photographer
Amateur Astronomer

Tabletop Observatory — Celestron 5 on Equatorial Wedge

Observing Convenience

Super-portability



Makes Photography a Snap

The World's Most Compact 5-inch Observatory Telescope

In one compact package, the Celestron 5 combines large, razor-sharp optics with an elegant simplicity of operation and a versatility unmatched by any other telescope in its aperture range. If you're seeking the finest available tabletop observatory for lunar, planetary and galactic cluster studies . . . plus the added utility of a superb daytime terrestrial telescope and the world's lightest 1250mm-f/10 telephoto lens . . . as well as a visual instrument that optional accessories convert to a high-power, deep-sky telecamera in minutes — then the Celestron 5 may be your telescope.

LARGE APERTURE . . . The 5-inch clear aperture of the Celestron 5 really makes high power worth using. Whether you're panning the landscape at 30X or sweeping the night sky at 300X with this large observatory telescope, you'll bring the mysteries of the world around you and the universe into sharp focus.

You'll close in whisker-to-whisker on a saucy squirrel at the near focus of 15 feet . . . study the frolicking of a bobolink at 150 feet . . . inspect a pine cone at 1000 feet.

You'll observe the moon with its infinite variety of tiny rills and craterlets. You'll study the polar caps of Mars . . . the twirling moons and multicolored belt structure of Jupiter . . . the fascinating rings of Saturn . . . the changing phases of Venus.

Within easy reach of the Celestron 5 are such stellar wonders as the Great Globular Cluster in Hercules, the "smoke ring" in Lyra and the Great Nebula in Orion.

PORTABILITY . . . If you want a super-portable instrument to take with you on campouts or a briefcase astronomical observatory so portable you'll always take it with you on remote star-party outings, then the 12-lb. Celestron 5 is what you're looking for. Slip it into its handy carrying case and it's ready to travel when you are. The complete Celestron 5 meets the requirements of aircraft carry-on luggage.

EASE OF OPERATION . . . The Celestron 5 features an elegant simplicity of operation. Rest it on any flat surface and it's ready for casual observing, nature studies or sweeping the night sky. The massively stable fork mount makes pointing this telescope as easy as pointing your finger. The eyepiece and controls are always conveniently located. For sustained astronomical viewing, just tilt the instrument up on our equatorial wedge, switch on the built-in electric clock drive and any celestial object you dial into view stays centered in the field automatically. Large, finely etched setting circles let you dial into view objects too faint to be acquired even through the finderscope. This is an instrument any technically oriented youngster can master on his first night out.

VERSATILITY . . . The Celestron 5 is more than a bannister telescope or tabletop observatory. Convenient photographic adaptors let you couple your 35mm camera body and click off dramatic close-ups of the moon and planets as well as terrestrial subjects. Demount the 3½-lb. tube and you have a telephoto lens capable of unvignetted action shots at 25X. Other accessories readily convert the Celestron 5 into a deep-space photographic instrument that records the structure of remote nebulae and galaxies on film in minutes.

Celestron 5 Nature, Planetary and Deep-Sky Photographs

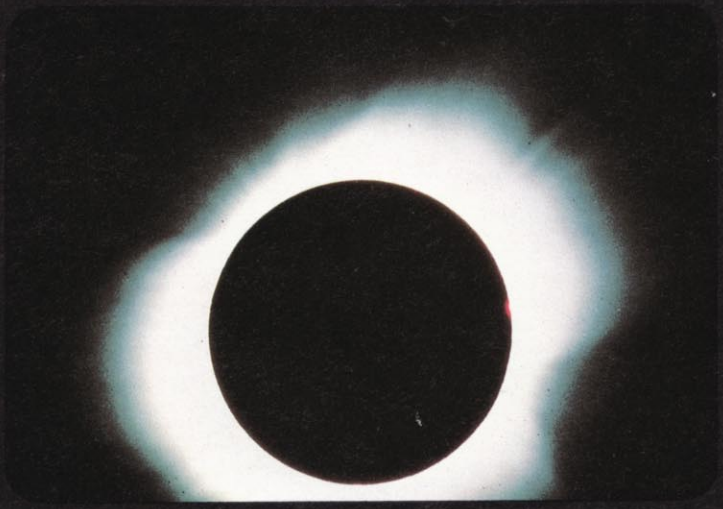
Whisker-to-whisker with a saucy squirrel at 25 ft.

Moon at 25X

Jupiter at 600X

Jays at 60 ft.

All photos above full 35mm frame.



The sun in eclipse bares its coronal streamers.

Lagoon Nebula (M 8) with C5 and Cold Camera.

Hercules Cluster (M 13) with C5 and Cold Camera.

Beehive (M 44) with C5 and Cold Camera.

Celestron® 8

For the Serious Amateur Astronomer
Deep-Sky Photographer
Astronomy Educator

The Most Coveted Amateur Astronomical Telescope — The Ultimate Terrestrial Telescope

Superbly Human Engineered

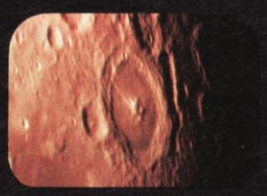
A Suitcase Observatory

CELESTRON 8 PHOTOS

The Orion Nebula (M 42 - M 43) with C8 and Tele-Compressor

Statue of Liberty at 3 miles

Lunar Eclipse



The Crater Petavius

Jupiter at 480X

Celestron 8

The Most Coveted, Most Highly Recommended 8-inch Observatory Telescope in the World . . .

The large optics of the Celestron 8 . . . its compact portability . . . its sheer usability and versatility have made this telescope the most coveted and most highly recommended in its aperture range among serious amateur astronomers and astronomy educators. Hundreds of Celestron 8 telescopes are in use at the nation's leading universities, observatories and science centers, as well as on display at major planetariums. (List supplied on request.) Here is a portable observatory in a suitcase, the ultimate terrestrial telescope, the world's most compact 2000mm-f/10 telephoto lens, and the telescope at the heart of the most extensive astrophotographic system ever offered to the serious amateur astronomer.

LARGE APERTURE . . . The 8-inch clear aperture of the Celestron 8 collects 510 times as much light as the unaided eye and permits magnifications ranging from 50X to 500X. The large aperture of the Celestron 8 is your passport into the hidden worlds of nature and into the realms of the serious amateur astronomer and deep-sky photographer.

With this instrument you'll study a bee pollinating a flower at the near focus of 25 feet . . . crisply frame the beauty of a butterfly from antennae to wingtip at 75 feet . . . catch the glint of sunlight in the eye of an eagle guarding its nest a mile away.

You'll visually explore hundreds of star clusters and gossamer nebulae as well as lunar and planetery details. You'll study the infinite detail of a terraced lunar craterlet . . . the divisions in the rings of Saturn . . . the mottled surface of Mars . . . the everchanging belt structure of Jupiter . . . the subtle range of soft glows in the Orion Nebula (M 42–M 43) or the Lagoon Nebula (M 8).

At this large aperture, intricate details are revealed in planetary nebulae such as the Dumbbell (M 27) in Vulpecula or the Helix (NGC 7293) in Aquarius, and globular clusters such as M 13 in Hercules or Omega Centauri (NGC 5193) are clearly resolved into hundreds of stars.

With the Celestron 8, planetary photography is a snap, and you'll make guided exposures of scores of deep-sky nebulae. You'll also capture on film the structure of remote galaxies such as the Whirlpool (M 51) in Canes Venatici, M 33 in Triangulum or the exploding galaxy M 82 in Ursa Major.

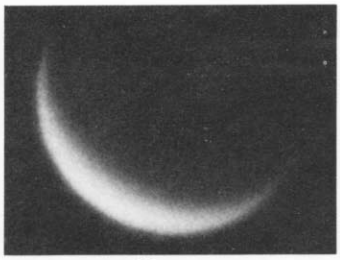
PORTABILITY . . . The 23-lb. Celestron 8 nestles snugly with all basic accessories inside one 12" X 16" X 30" carrying case. The complete optional Celestron 8 equipment group—which comprises the most extensive astrophotographic system ever offered to the amateur—fits compactly in the back seat or trunk of your car as you travel to a remote site for a star party.

EASE OF OPERATION . . . The same elegant simplicity of operation that characterizes the Celestron 5 (see page 2) has been extended to the basic Celestron 8 and to its sophisticated equipment group. No matter how you equip your Celestron 8, your astrophoto lab will retain the same simplicity of set-up and operation that has earned Celestron telescopes the reputation of being the most usable large-aperture telescopes in the world. The Celestron 8 is completely human engineered, virtually student-proof and as maintenance-free as a telescope can be.

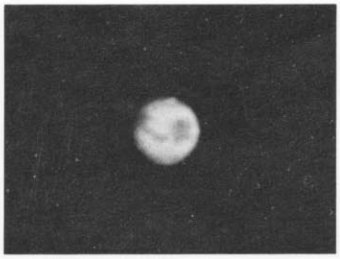
VERSATILITY . . . As the finest available 2000mm-f/10 terrestrial telescope and telephoto lens . . . as a superb astronomical telescope of sufficient aperture for use in the joint amateur-professional observing programs . . . as an educational tool that lends itself as readily to timing a shadow transit across the face of Jupiter as it does to studying the nesting habits of a warbler 1,000 feet away . . . as part of an astrophotographic system that lets you duplicate on a smaller scale some of the most advanced techniques practiced at the major observatories—the Celestron 8 is the most versatile telescope in the world. (See pp. 9, 10 and 11.)

. . . A Telescope for Planetary, Nebular and Extragalactic Photography

Jupiter



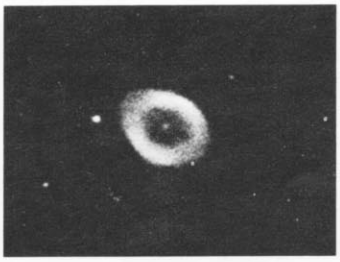
Venus



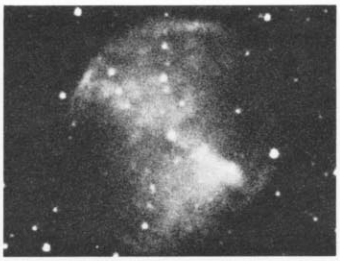
Mars

Lunar Craters

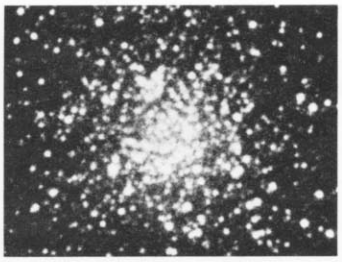
The Crab Nebula



The Ring Nebula

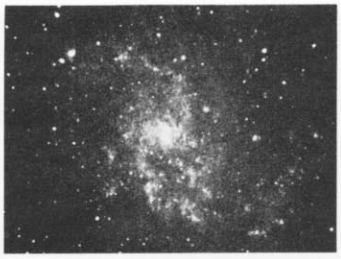


The Dumbbell Nebula



Globular Cluster M 22

The Whirlpool Galaxy



Galaxy M 33 with Tele-Compressor

NGC 253 with Tele-Compressor

M 81 and M 82 / Tele-Compressor

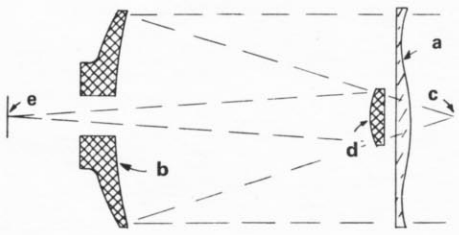
Celestron 8 Photographs

Telescope Specifications

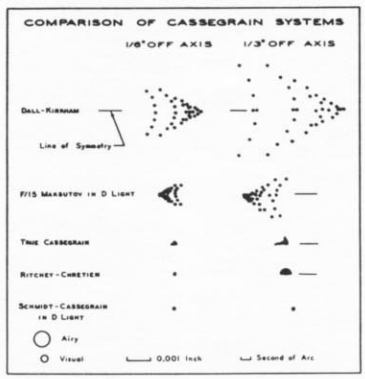
Basic Instrument Specifications

CELESTRON	5	8	14
Clear Aperture	5"	8"	14"
Light Grasp (compared to unaided eye)	188X	510X	1,760X
Cassegrain Focal Length	50"	80"	154"
Useful Magnification	30-300X	50-500X	50-850X
Resolution (theoretical limit)	0.8 arc sec 197 lines/mm	0.5 arc sec 210 lines/mm	0.28 arc sec 171 lines/mm
Airy Disk Brilliance Factor at 160X (compared to 3½")	4.2X	27.5X	256X
Faintest Stellar Magnitude	13.5	14.4	15.4
Photographic Speed	f/10	f/10	f/11
Image Scale (Field of View)	1.12°/inch	.72°/inch	.37°/inch
Field at 30 ft. 35mm format, 100 ft. Long Dimen. 1,000 ft.	7" 23.5" 19.6'	4.5" 15.2" 12.6'	— — 6.4'
Unvignetted Field	1.8" circle	2.75" circle	3" circle
Near Focus	15'	25'	500'
Secondary Obstruction	2"	2¾"	4½"
Finderscope	5X – 24mm	6X – 30mm	10X – 40mm
Eyepieces	25mm – 50X 12mm – 100X	40mm – 50X 25mm – 80X	40mm – 110X 25mm – 170X 12mm – 340X 6mm – 710X
Star Diagonal	24.5mm (0.96")	1¼"	2"
Setting Circle R.A. Diameter Dec.	6¼" 4"	8" 4"	9½" 6"
Drive Gear Dia.	4½" Spur	6" Spur	6¾" Worm
Clock Power (110V, 60Hz)	6 Watts	6 Watts	10 Watts
Slow Motions	Manual	Manual	Electric, both axes
Photographic Accessories	Optional	Optional	T-Adaptor Tele-Extender Piggyback Mount
Weight	12 lbs.	23 lbs.	108 lbs.
Size–Swung Down	7" X 8" X 16"	9" X 12" X 22"	18" X 22" X 44"
Carrying Case	8" X 12" X 24"	12" X 16" X 30"	Tube Assembly Case: 21" X 22" x 36" Fork/Accessory Case: 12" X 21" X 36"
Shipping Weight	25 lbs.	50 lbs.	200 lbs.

The Schmidt-Cassegrain System



The light enters the system through a thin glass aspheric corrector plate (a); it is then reflected by a large spherical primary mirror (b) toward the prime focus (c). The light from the primary is intercepted by the convex secondary mirror (d) and reflected back through a hole in the primary mirror to the Cassegrain focus (e). The effect of folding the optical path back with a convex secondary mirror also increases the effective focal length by a factor of three to seven times that of the primary alone.



The computer ray-trace diagram above, from an article by R. Willey, *Sky and Telescope,* April 1962, plots the path of light rays as they pass through the different Cassegrain systems, 1/6th° off-axis and 1/3rd° off-axis. The spread of dots representing optical distortion reveals that the sharpest images are produced by the Schmidt-Cassegrain.

Testing and Guarantee

The optical components of Celestron Telescopes are manufactured to such exacting standards that good performance could be achieved simply by randomly assembling them into a telescope. But we aren't satisfied with just good performance. Each of our systems is set up in a laser collimator capable of detecting 1/100th wave errors. Then we aspherize the secondary mirror to bring each system to an optical null. Our optical guarantee is as follows: Using a point source at infinity (star test) and with the system properly collimated, a knife edge shall indicate a clean optical null. The shadow bands shall appear straight when tested with a 100-line Ronchi grating (three lines intercepting the cone). The intra- and extra-focal diffraction patterns shall appear similar with regard to the central obstruction when using a 12½-mm ocular with the out-of-focus blur circle filling one-third of the field. Further, each Celestron is serialized, registered and guaranteed to be free from defects in material and workmanship for a period of one year subject to repair or replacement at our factory.

The Fork Mount

The fork mount and base of the Celestron give you complete pointing freedom of the telescope. The two-axis system gives you rotational control by the precision ball bearings in the base of the mount and tilt control with permanently lubricated bearings at the end of each fork tine. You have complete 360° rotation of the instrument at each of these axes. When the telescope is set upright on a flat surface, it is an ALT-AZIMUTH. The base axis is vertical and allows pointing in azimuth—along the horizontal. The tube tilts in the fork tines to provide altitude control. Tilting the base up so that the base axis parallels the earth's axis of rotation converts the Celestron to an EQUATORIAL. The base axis is then referred to as the POLAR AXIS, and motion about this axis is referred to as motion in RIGHT ASCENSION (R.A.) In this position, a line passing through the bearings at the ends of the fork tines is the DECLINATION AXIS, motion around which is referred to as motion in DECLINATION (Dec.) On the front cover of this booklet are pictured the Celestron 5 in alt-azimuth configuration, and the Celestron 8 and Celestron 14, each mounted on tripod and wedge assembly, in equatorial configuration.

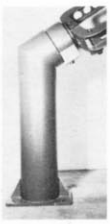
The Clock Drive

Installed in the base of each Celestron Telescope is a highly accurate synchronous motor drive system. You need only plug the cord into a 120V-60Hz outlet, place the instrument in its equatorial position, and the system will rotate the telescope counter to the earth's rotation so that a star will remain centered in the field even at high magnification.

The Finder Scope

Each Celestron Telescope is equipped with a small auxiliary finder scope, which assists you in finding objects to observe through the main optics. This finder is large enough to spot most of the Messier objects under dark-sky conditions. No Diagonal is provided with the finder—use it as you would a telescopic gun sight, with both eyes open. The finder scope is not intended to be used as a photographic guide scope. It is too small and its magnification is not sufficiently great.

Accessories for Your Celestron



Permanent Pier—Plans are included with each Celestron so that you may have a local welding shop fabricate a heavy-duty steel pier for permanent observatory installation of your telescope. The latitude angle is a permanent part of the weldment. If you wish, we will have one of these piers fabricated for you and include it with your order.

Locked-Triangle Tripod—We tested all of the heavy-duty photographic and TV tripods but found none adequate for a high power telescope. Our engineering department was therefore given the assignment of designing the ultimate tripod for portability and rigidity. The result is a rigid, Locked-Triangle Tripod. This tripod is offered in two sizes: the C5-C8 unit which weighs 12 pounds, and the C14 unit shown here which weighs 32 pounds. Use the appropriate wedge.

Rigid Equatorial Wedge—This unit is an assembly of heavy-duty aluminum castings. It is used to tilt your Celestron up to your latitude angle so that the clock drive may function properly and the setting circles give accurate readings.

Erect Image Viewing—All lens systems produce inverted images at their first focus. If you wish to use your Celestron for terrestrial viewing, you will want an image erector. The diagonal supplied with the Celestron inverts the image but leaves it left-for-right. If you wish in-line erect image viewing, an optional Porro-Prism Erector is offered.

Oculars—The Kellner design of the oculars supplied with each Celestron gives optimum performance with the f/10 light cone. No improvement in performance would result by substituting more expensive oculars. Additional oculars for each instrument are offered as accessories should you wish to expand your ocular collection.

Barlow Lens—This increases the magnification of your Celestron when using a given ocular. It inserts into the draw tube of the instrument ahead of the prism or ocular. It consists of a negative achromatic lens mounted in a barrel assembly. Many observers prefer a Barlow lens for high magnification rather than the shorter focal length oculars. The Barlow also increases the eye-relief position of the ocular with which it is used.

Special Coatings—For those who wish the absolute maximum transmission of light through their Celestron, special broad-band high-transmission coatings are offered. For the C5 and C8 these consist of magnesium-fluoride anti-reflection coatings on the corrector and multi-layer enhanced coatings over vacuum deposited aluminum on each mirror. This results in a 15% increase in transmission. The special coating group for the C14 includes mag-fluoride coatings for the corrector and enhanced silver on the mirrors resulting in a 17% transmission increase.

Visual Back—This converts the universal 2" threaded back of the Celestron to the barrel diameter of the oculars provided. Both a 0.98" and 1¼" unit are offered. The appropriate visual back is supplied with each Celestron but the other may be purchased as an option to expand the utility of your instrument.

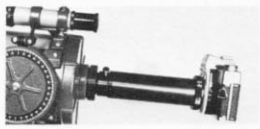
Solar Filters – These consist of vacuum-deposited Inconel over highly accurate optical windows. They reduce the solar light intensity to 1/10,000th for safe solar observing. The filter is mounted in a ring which in turn is placed over the front cell of the telescope. Instant injury to the eye can result if the telescope is pointed at the sun and if you attempt to view the sun with either the finder or main scope without the appropriate filter in place.

Diagonal—This is simply a right angle device used for more comfortable viewing of objects near the zenith. The C5 and C8 diagonals are prism type having barrel diameters of 0.98" and 1¼" respectively. The diagonal supplied with each C14 is an oversize unit for use with 2" oculars as well as the 1¼". This unit uses a diagonal mirror which is enhanced silver coated.

Photographic Accessories

T-Adaptor The "T" System has been adapted by 35mm camera manufacturers as the universal lens interchange. Most any 35mm SLR camera having a fully removable lens and focal plane shutter can be used with the "T" system simply by obtaining a "T" ring. The T-adaptor in turn couples this combination to the Celestron.

"T" Rings—We stock a limited number of the common "T" rings for various cameras. These are listed on the attached price sheet.



Tele-Extender—This converts your Celestron to a planetary camera. It allows you to space your camera back so that an ocular may be inserted in the draw tube ahead of the camera. The ocular acts as an enlarging lens projecting the enlarged Cassegrain image of the Celestron onto the film of your camera. Using the Tele-Extender the 25mm ocular gives a 3X enlargement and the 12mm ocular gives an 8X enlargement.

Counterweight Set—In order for the sidereal drive system of the Celestron telescope to function properly, the instrument must be balanced about its polar axis. The instruments are sufficiently well balanced for proper operation with the visual accessories and for a close couple light weight camera. If you wish to use the Tele-Extender or other instrumentation load you must use counterweights to achieve proper balance. Different sets for the various instruments are offered and priced on the attached sheets.

Drive Corrector—The universal drive corrector operates on 110v a-c or 12v d-c power. This unit serves a dual function. If you wish to operate your Celestron in the field where no a-c power is available for the clock drive, it acts as a converter changing the 12v d-c from your auto battery to the 110v a-c for the drive. If you are making long guided photographic exposures with your Celestron, the unit, with its push-button fast-slow controls, serves to help you keep the telescope accurately pointed during the exposure. The unit draws about 10 watts of power.

Coaxial Camera Mount— This accessory allows you to mount your 35mm camera on the side of the Celestron. The better 35mm cameras are generally provided with an f/1.8 50mm taking lens. This gives a film coverage of 25° x 36° thereby providing you an excellent constellation or Milky-Way camera. Your Celestron serves as the stable platform and guide scope for your camera during the long exposures (1 to 60 minutes depending on the nature of the photographic field). Please note that the mount is different for each size Celestron.

Off-Axis Guiding Eyepiece Assembly—

A small prism is inserted into the side of a T-Mount camera adaptor so that the light from a star just off the axis of the field you wish to photograph is diverted into a 12mm illuminated reticle ocular. This allows you to simultaneously guide and photograph through the main optics of your Celestron. The utility of this device is limited by the availability of a suitably placed star sufficiently bright near the object you wish to photograph. The unit is also supplied with a small adjustable battery pack.

Illuminated Reticle Ocular—This is a 12mm orthoscopic ocular with built-in reticle. It is the same unit that is supplied with the off-axis guider listed above.

Schmidt Camera—See page 11 of this catalog.

Cold Camera—See page 10 of this catalog.

Celestron Tube Assembly—If you wish to use a Celestron telescope on a mount or drive of other manufacture, you may purchase the tube assembly of the C5, C8, or C14 separately. When so supplied, these assemblies are provided with a flat tripod mounting block fixed to the side. They are also supplied with the finder scope and visual back but with no oculars or other accessories.

Celestron Guide Scope—The Celestron 5 and Celestron 8 tube assemblies may be purchased as guide scopes for the larger instruments. When so ordered they come to you equipped with a special tangent coupler which allows you to guide from a star up to 2½° degrees away from the object being photographed. Also included are the appropriate finder scope, visual back, diagonal, and 12mm illuminated reticle ocular.

Some Telescope Facts and Hints

What size telescope best suits you needs?

First you must decide whether you'll be using the telescope for nature studies and other daytime usages such as bird watching and landscape studies on the one hand or at the other extreme whether amateur astronomy will become your number-one hobby.

For daytime telescope usage you will find magnifications that will give you the greatest utility are in the range of 50 to 150 power. Due to mismatch of the exit pupil of the telescope (objective diameter divided by the magnification), with the entry pupil of the daylight adapted eye, you will find that larger telescopes vignette down to an effective diameter of 4 to 6 inches. This simply means that no matter how large a telescope you use for daytime visual work at the magnification range mentioned above, it will be no more effective than a 5-inch. Our own extensive analysis of telescope aperture has led us to the conclusion that the Celestron 5 is the optimum instrument for daytime terrestrial work and as a telephoto lens. It is also sufficiently large for the casual amateur astronomer to delight in the crisp views it presents to him of the Moon and planets as well as the popular Messier list of deep-sky wonders.

The serious amateur astronomer will be content only when he can observe and photograph some of the faint deep-sky nebulous objects. He must therefore keep in mind some of the simple arithmetic of telescope aperture. If you double the diameter of a telescope objective, you pick up four times the light from a faint stellar object. Further, due to the wave nature of light, the image of a faint star will appear as a small round ball (the Airy disc) at the focal plane of a telescope. The size of the Airy disc at a given power becomes smaller as you increase the diameter of the telescope objective. This explains why a 4-inch telescope has a theoretical resolution limit of 1 arcsecond and an 8-inch ½ arcsecond. In short, if you double the aperture of a telescope but keep the magnification constant at say 150X you pack 4 times as much light into an image of ½ diameter resulting in a brilliance increase of 16 fold. To test this effect for yourself simply find a dark-sky demonstration site where you can compare an 8-inch telescope with a 4-inch. Look at M 13, the Globular Cluster in Hercules, and M 42, the great Orion Nebula. Through the 4-inch M 13 will appear as an amorphous blob, but through the 8-inch it will be easily resolved into thousands of individual stars. Through the 4, M 42 will clearly show you its bat-wing structure, but the 8-inch will show many faint filaments swirling through the nebula. We therefore recommend that the serious amateur astronomer purchase the largest aperture telescope that his budget and portability requirements will allow.

Dial-a-Star with accurate setting circles.

Each Celestron telescope is equipped with highly accurate setting circles in both Right Ascension and Declination axes. After you have set up the telescope so that the polar axis of the instrument parallels the axis of rotation of the Earth (easy instructions included with the instrument involve sighting Polaris with the finder scope), you can use the setting circles and simple star charts to point the telescope at objects of interest and to find deep-sky nebulae and clusters too faint for the finder scope.

Magnification

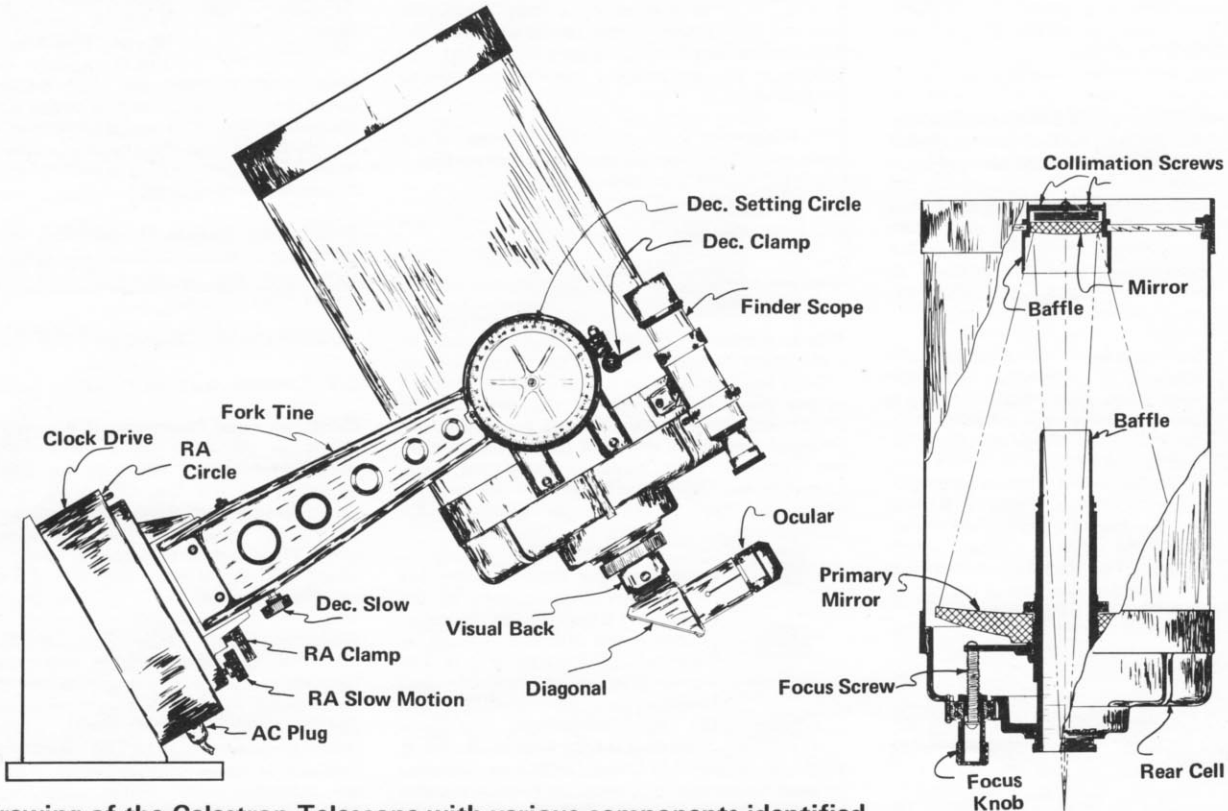
The apparent magnification of a telescope when looking through the eyepiece is determined by the effective focal length of the objective system of the instrument divided by the focal length of the eyepiece used. For instance using a 25mm ocular with the C8 (2000 mm e.f.l.) the magnification is 80X. The same ocular in the C5 (1250 mm e.f.l.) gives 50X.

The optimum magnification for any telescope under good conditions is about 20 power per inch of the objective diameter. This is the magnification at which the images appear the most pleasingly sharp. If everything is going right, you can increase the magnification to as high as 60 diameters per inch of telescope objective diameter for high-power views of planets or lunar craters. This would be 300X, 480X and 840X for the Celestron 5, 8, and 14 respectively. Higher magnification than these figures is empty magnification and would simply cause the images to appear fuzzy.

Of course the object that you are looking at through your telescope usually dictates the power that you will use rather than the magnification limits of your instrument. For instance, the full disc of the Moon cannot be observed at magnification in excess of 50X. The optimum magnification for Jupiter is about 200X. The Ring Nebula is best at about 150X.

Light Grasp—Airy Disc Brilliance Factor

The light grasp of a telescope is set by the collecting area of the objective lens and the transmission losses through the optical system. For a rule-of-thumb, consider that a one-inch diameter telescope would cause a stellar image to appear nine times brighter than to the unaided eye! By comparing light collecting area, a 5-inch telescope would gather 25 times more light than a one-inch and therefore would be 225 times brighter than the unaided eye. Correspondingly, the 8 and the 14 would be 576 and 1764 times brighter than the unaided eye. If you compare brightness of faint stellar images in telescopes of different diameters but at the same magnification, 150X for example, another factor must be considered. The stellar image (Airy disc) becomes smaller as you increase aperture. In other words, if you double the aperture of a telescope at a given magnification, you pack 4 times as much light into an image of one-fourth the area resulting in a brilliance increase of 16 fold. We call this the Airy Disc Brilliance Factor. Using a 3½" telescope as a reference the Brilliance factor would be 3½"–1; 5"–4.16; 8"–27.29; 14"–256.



Drawing of the Celestron Telescope with various components identified.

Photography with Your Celestron

Terrestrial Photography—Your 35mm single-lens reflex camera can be readily attached to a Celestron Telescope using the universal "T" adaptor system. This gives you the capability of performing a variety of extreme telephoto assignments. The Celestron 5 or 8, for example, is a superb daytime telephoto lens with magnification of 25X and 40X respectively (the increase in magnification over your 50mm taking lens). The f/10 speed allows shooting speeds of 1/500 and 1/1000th second so that you don't have to be too concerned about vibration spoiling your shots. The same combination can be used for dramatic shots of the Moon and small-scale shots of the planets. Here you are using the Celestron for essentially snap-shot photography. If you wish to photograph a deep sky nebula, additional equipment is required—see guided photography below.

The Planetary Camera—At the direct magnification at the Cassegrain focus of your Celestron the image of even the larger planets is small. (Jupiter's image with the C8 on film would be about 1/32 inch in diameter.) Using the Tele-Extender offered as an accessory, you use one of your oculars to project the image to a considerably larger size onto your film. This device is useful also for enlarging up an individual feature of the Moon so that it fills the entire 35mm negative. Using the Tele-Extender you'll be able to increase the effective focal length of your Celestron 3 to 16 times and your exposures will range from 1/10th to 10 seconds.

Constellation Photography—Your 35mm SLR, if it has a good sharp taking lens at f/2 or faster, can be used as a constellation or Milky-Way camera. Typical coverage is 24° x 36°. Long exposure is required—5 to 30 minutes. In this period, stars would trail and faint nebulae would wash out due to the rotation of the Earth. Your Celestron can serve as a stable platform on which to mount your camera. The drive motors compensate for the rotation of the Earth, and you can even keep a star under surveillance with the main telescope optics during the exposure.

Schmidt Camera Photography—If you have your own photo lab and an intense interest in astrophotography, a Schmidt Camera will give you results that cannot be obtained in any other manner. (See page 11 on Schmidt photography for further details.)

Guided Deep-Sky Photography—The Celestron 5, C8, or C14 each becomes a superb astrocamera for long exposures of faint deep-sky objects. By allowing the images to build up on sensitive film, you can make photographs of objects that are much fainter than you can detect visually through the same instrument. For best resolution, the image cannot shift the slightest bit during the exposure. This requires guiding. A star near to or in the same field you are photographing is kept under surveillance and on the cross hairs of a high-power ocular. This allows you to make small corrections in the telescope position during the exposure. See page 7 for guiding accessories and drive corrector.

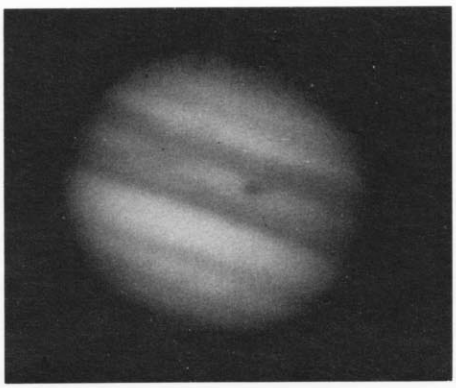
The Tele-Compressor—When making a deep-sky guided exposure you will no doubt find that, due to atmospheric scintillation and possible guiding errors, your shots will seldom approach in detail the resolution limit of your instrument. Nor will they even approach in resolution the grain size of practical films. For this reason you may wish to trade image scale for decreased exposure time. If, for instance, you can halve the effective focal length of your f/10 Celestron for photographic use, you also halve the image scale; but you have the desired effect of reducing the exposure time by a factor of 4. A Tele-Compressor lens assembly is offered for this purpose as an optional accessory.

Just Picture What You Can Photograph

A Backyard Visitor
Celestron 5

The North American Continent and a Pelican in the Sky
5½-inch Schmidt Camera with red filter

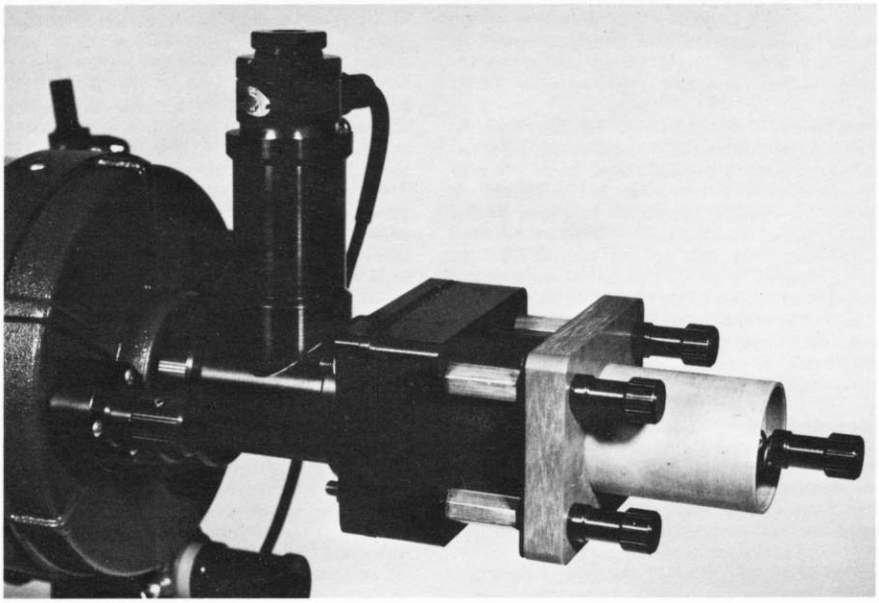
Seven Mythological Sisters
8-inch Schmidt Camera



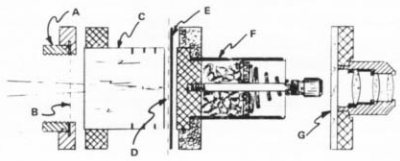
The Largest Planet
Celestron 8

A Galaxy 10 Times Larger than Ours
8-inch Schmidt Camera

The Celestron-Williams Cold Camera



The Celestron-Williams Cold Camera with off-axis guider coupled to the Celestron 5 Telescope.



Cross-section of the Celestron-Williams 35mm Cold Camera: A—adaptor body, B—Shutter gate, C—optical plug, D—film, E—dew shield, F—dry ice chamber, G—focusing ocular assembly.

The Celestron-Williams cold camera attaches to a telescope and maintains the film at a very low temperature during the photographic exposure. This has the effect of greatly increasing the light grasp of a given astrophotographic setup when using certain types of film.

Narrow-field photography of faint nebulous objects requires long time exposures to build up the image on film with the long focal length telescopes generally used for this type photography. One generally assumes that in taking a photograph he simply doubles the exposure time with a given lens and film type to compensate for half the object brightness—this is the reciprocity rule. Unfortunately this simple rule does not apply to many of the faster films that one would like to use for making astro-photos of faint objects. As a matter of fact there is a low threshold light level below which certain films will not respond no matter how long the exposure. For this reason Tri-X film and High-Speed Ektachrome films are seldom used for astrophotography as their actual photographic speed at low light level is much less than the considerably slower Plus-X and Ektachrome-X films.

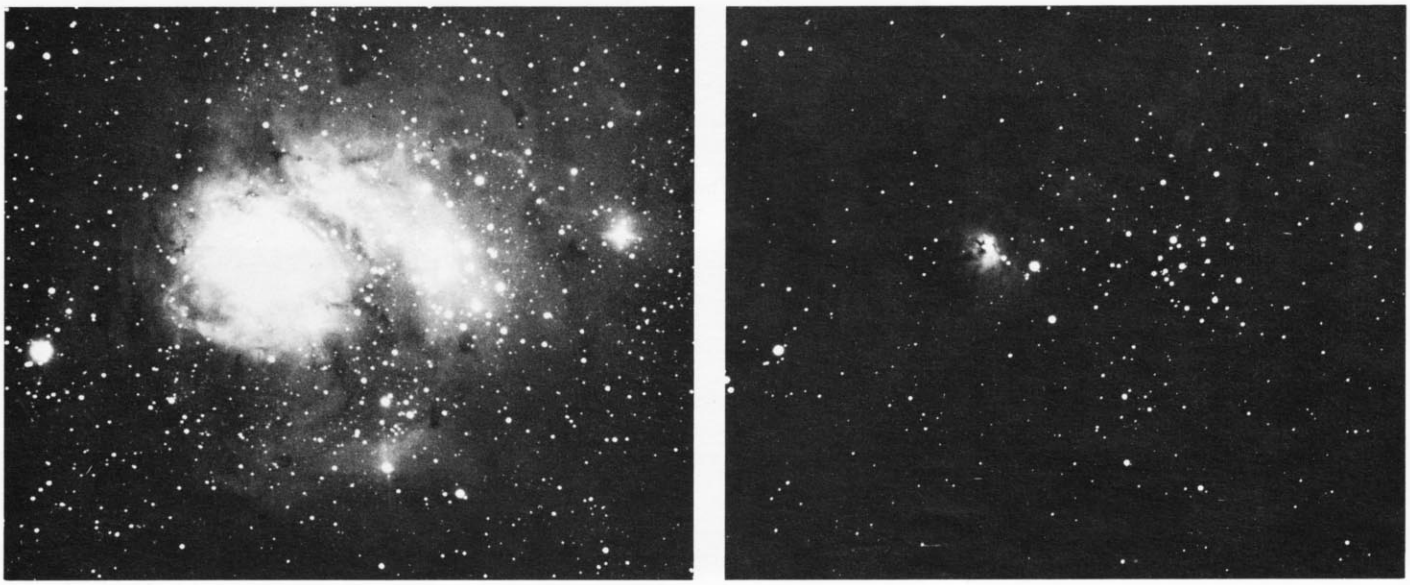
Fortunately for those astrophotographers who wish to achieve the ultimate in capturing on film the fainter deep sky objects, the low light threshold level for both Tri-X and HSE can be considerably extended by chilling the film to sub-zero temperatures during the photographic exposure. As a matter of fact, when chilled and used at f/10 under dark sky conditions Tri-X and HSE have exposure times limited by sky fog of about 20 minutes and 35 minutes respectively. This means that Tri-X becomes almost 3 times faster for astrophotography than 103aF film.

How do you operate the cold camera with your Celestron? It attaches to the back of the instrument with the adaptors provided. You locate the object to be photographed with the ocular and reticle assembly (also a part of the cold camera), bring it to a sharp focus at the back surface of the optical-thermal isolator plug, snip off a piece of film and place it against the thermal plug, fill the dry ice reservoir, snap it onto the back of the camera assembly, remove the shutter plate, and you are making your exposure. Photographic guiding can be accomplished using the off-axis guiding system (sold separately) or by a separate guide scope.

The Celestron-Williams 35mm Cold Camera may be used with the Celestron 5, 8, or 14. It threads to the universal T-mount system. This unit is supplied with two thermal isolator plugs so that you can alternate—one would be stabilizing back to ambient temperature while you are using the other. A 25mm ocular assembly clamps to the back of the isolator plug to assist you in locating the object to be photographed and to achieve sharp focus.

The Celestron-Williams 120mm Cold Camera provides a three-inch circular format. It is designed for use with the Celestron 14 only. The unit is supplied with two thermal isolator plugs and a 25mm ocular assembly for field finding and focusing. When using this camera on the Celestron 14 you must guide. We recommend that you consider either the C5 or C8 photographic guide scope.

Recommended films for use with the cold camera. The sole purpose of the cold camera is to lower the threshold light level of certain fast films which would otherwise be useless for astrophotography. Tri-X is the best choice for black-and-white work and high-speed Ektachrome or Ektachrome-X for color work.



THE ADVANTAGE OF CHILLED-EMULSION ASTROPHOTOGRAPHY—Above, two photos of the Lagoon Nebula (M 8). The left photo was captured on ordinary Tri-X film chilled to sub-zero temperature with the Celestron-Williams Cold Camera. Exposure: 20 minutes with the Celestron 14 Telescope. The right photo was recorded with the same film, equipment, exposure time and image scale—but without chilling.

The Celestron Schmidt Camera

The 14-inch Schmidt Camera has a focal length of 24 inches and a photographic speed of f/1.7. It is designed to interchange with the Celestron 14 telescope in its fork mount. As a guide scope for this camera you may consider either the C5 or the C8 shown here with the appropriate mounting hardware.

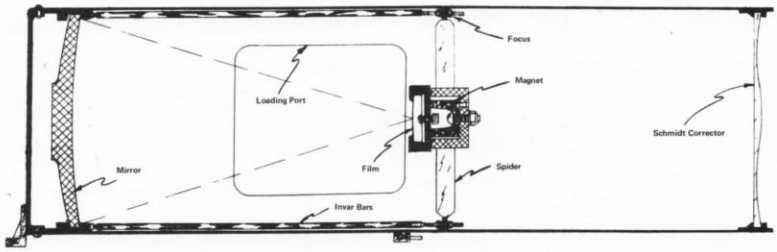
The 8-inch f/1.5 Schmidt Camera is designed to mount on the Celestron 14 or to interchange with the Celestron 8 Telescope in its fork mount. When mounted on the C-14, the larger telescope serves as the guide scope. When used in the C-8 fork mount a separate guide scope must be mounted on the Schmidt Camera. The Celestron 5 is ideal for this purpose. When ordering the 8-inch Schmidt Camera please specify the combination you desire so that proper mounting brackets can be provided.

The 5½" Schmidt Camera has a focal length of 9 inches and a photographic speed of f/1.65. It easily mounts on the Celestron 8 using the brackets provided (no additional holes need be drilled in the standard Celestron 8). In this configuration the equatorial mount of the 8-inch telescope serves as your stable platform for the Schmidt Camera, and you guide through the main optics of the C-8 during your photographic exposure. The same set of brackets can be adapted to mount this Schmidt Camera on telescopes of other manufacture.

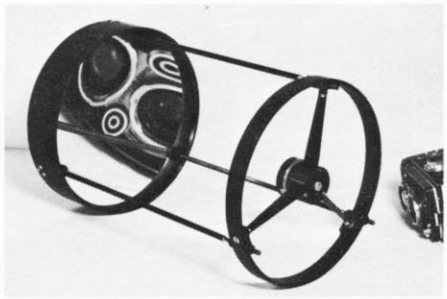
The Schmidt Camera is an instrument which can photograph wide sections of the sky with such detail that tiny sections of the negatives yield the extent of their definition only when examined with a high-power microscope or photographically enlarged 50 to 100 times. The fast speed of the lens system accomplishes these superb results in exposures ranging from a few seconds to 10 minutes.

Historically the Schmidt Camera has proven to be one of the most powerful research tools of modern astronomy. The famous 48-inch Palomar Schmidt Camera has figured prominently in more scientific discoveries than any other single instrument in existence. Educators, serious astrophotographers, amateurs and research institutions may now avail themselves of a Schmidt Camera at the modest price of a Celestron. These smaller instruments perform in exactly the same manner as the giant research instruments but are greatly simplified in operation. Note the amazing resolution of the Celestron Schmidt Camera photos reproduced in this catalog. We also offer a complete color slide library of Schmidt deep-sky objects—send for details.

The optics of a Schmidt Camera consist only of a large spherical mirror of short focal length, a film holder that flexes the film to conform to the curved focal plane, and a Schmidt corrector lens. The implementation of a high-definition Schmidt Camera, however, places unusual demands of accuracy and stability on both the optical and mechanical components. The optical components of the Celestron Schmidt Cameras are produced to the same diffraction-limited quality as our visual Schmidt-Cassegrain telescopes, and extreme efforts are made to give you a stable mount for these components. The mirror cell and spider assembly are mounted to an INVAR-bar cage assembly which permanently holds these components in their correct positions. Focus is factory adjusted and fixed assuring you of uniformly sharp photos.



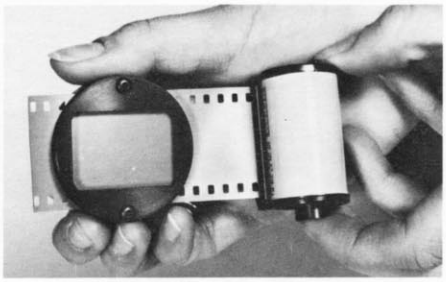
Scale Drawing of Celestron 5½-inch Schmidt Camera



Mirror Cell with Invar Spacing Bars

Film Holders

One 35mm film holder each is supplied with the 5½" and with the 8" Schmidt Camera. Larger format cannot be used with these units. Two each 35mm and 120mm film holders are supplied with each 14-inch Schmidt Camera. Film holders are not interchangeable so if you wish additional film holders they should be ordered with the instrument.



Loading the Film Holder

Filters

Much of the sky-fogging which limits exposure time of the Schmidt Camera is in blue light. Fortunately many of the deep sky nebulous objects are predominately red. A red Gel filter can therefore be used with the Schmidt Camera to enhance (considerably) the density in red light. The filter is placed directly in front of the film holder and must be of the thin gelatin type to avoid shifting the focus too much. For those who wish to preserve the exact focus of the Schmidt Camera when used with these filters, we can provide special film holders which allow for the focus offset.

Custom Modifications

Since each of the Celestron Schmidt Cameras is factory aligned and focused, we recommend that you not attempt to disassemble one of these units to drill holes or mount other types of brackets. Should you wish to provide a different mounting arrangement than that offered, you should let us know at the time of your purchase so that modifications can be made prior to the original assembly.

Schmidt Camera Specifications

Aperture	**5½"**	**8"**	**14"**
Focal Length	9"	12"	24"
Speed	f/1.65	f/1.5	f/1.7
Image scale (degrees/inch)	6.35	4.8	2.4
Sky coverage			
35mm format	5.9 x 8.6°	4.5 x 6.5°	2.3 x 3.2°
120mm format	—	—	5 x 6.5°
Light drop-off at corner of field	15%	17%	7% 15%

Celestron 14

The World's Largest One-Man-Portable Astronomical Observatory Telescope

Revolutionary in concept and design, the Celestron 14 for the first time makes truly portable a telescope with aperture approaching professional size. This is the world's largest one-man-portable observatory telescope. In 10 minutes, one person can demount the Celestron 14, load it into a compact car and be on his way to a remote star-party outing. Yet this prestigious instrument can be installed proudly on pier under a permanent dome. With an aperture suitable for advanced research projects or student training . . . with special high-transmission optical coatings . . . with a massively stable fork mounting . . . with remote-controlled electrical slow motions in both axes — the Celestron 14 is the optimum investment for the advanced amateur astronomer, university observatory or science center.

Light grasp — 1,760 . . . Brilliance Contrast Factor — 256 . . . Magnification — 50 to 850X . . . Resolution — 0.28 arcsec.

Massive Observatory Telescope . . . In spite of its compact size and light weight, the Celestron 14 is a massively stable instrument. The short stubby tube of its folded optical system and space-age structural engineering principles embodied in the design of this instrument give image stability found only in massive observatory telescopes.

Optical Folding . . . The 154-inch (12.8-foot) focal length of the Celestron 14 is accomplished by multiple passes and secondary magnification within the stubby tube of the instrument.

Electrical Slow-Motion Controls . . . Push-button actuators in a small hand-held controller allow you to crater hop while viewing the Moon or to make infinitesimally small corrections in telescope point while guiding a photographic exposure.

LARGE APERTURE PLUS . . . The superior aperture of the Celestron 14 and its special optical features invite you—the advanced amateur astronomer, the professional educator, the research specialist—to undertake projects that place you at the very frontier of your field of interest.

The 14-inch clear aperture of this instrument . . . its base-price enhanced-aluminum optical coatings that transmit as much light to the focal plane as a conventionally coated 16-inch Cassegrain telescope . . . its optional silver and magnesium fluoride coatings that transmit as much light to the focal plane as a conventionally coated 17½-inch Cassegrain . . . assure you that you can undertake high-contrast observation or photography even under adverse lighting conditions.

Tabulation of Transmission Data . . . In terms of total light transmitted to the focal plane, the base-price Celestron 14 is equivalent to a 16-inch Cassegrain telescope with standard coatings, and the Celestron 14 with optional coatings is equivalent to a 17½-inch Cassegrain.

OPTICAL TRANSMISSION COMPARISON CHART

Telescope Type	Coll. Area	Transmission At Each Element: Sec. Obs.	Pri.	Sec.	Diag.	Correc.	Total Trans.	Equivalent 100% Trans. Diameter
16-in. Cass.[1]	206	.90	.85	.85	.85	–	55.4%	11.67 in.
Celestron[2] *14*	154	.90	.94	.94	.98	.91	71%	11.7 in.
17½-in. Cass.[3]	240	.90	.85	.85	.85	–	55.4%	12.6 in.
Celestron[4] *14*	154	.90	.98	.98	.98	.97	82%	12.6 in.

[1] *Standard aluminum with silicon monoxide overcoat.*
[2] *Base-price enhanced aluminum and silver coatings.*
[3] *Standard aluminum with silicon monoxide overcoat.*
[4] *Optional multilayered high transmission silver coatings and AR-coated corrector.*

VISUAL USAGE . . . With the Celestron 14, the lunar surface becomes a stark terrain of varied and delicate contrasts. Crater chains, meandering rills and lava flows stand out in bold relief.

Under good seeing conditions at 850X, the rings of Saturn resolve into numerous subdivisions against the background of its banded globe, and the moons of Jupiter are marked with fleeting detail. Even idling at 50X under adverse seeing conditions, the Celestron 14 still reveals Jupiter's belt structure—festooned in reds, yellows, blues and greys—with the crisp definition of a black-ink line drawing.

Within visual reach of this prestigious telescope are the brilliant cores and stellar concentrations of the globular clusters . . . the secondary filamentary structure of the extended nebulae . . . the delicate contrast levels of the planetary nebulae . . . and dust lanes in spiral galaxies pinwheeling through the void.

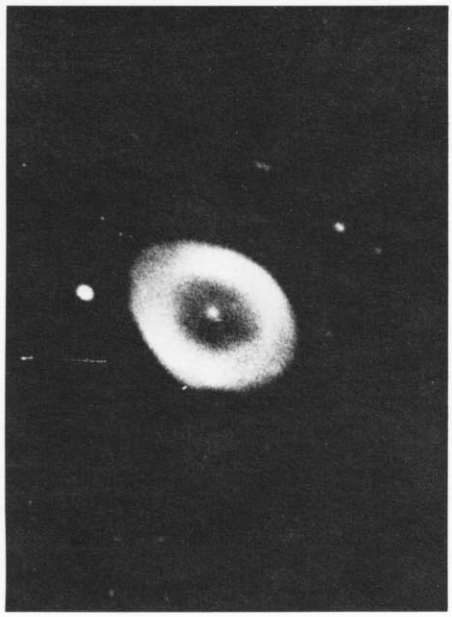
PORTABILITY . . . We designed the Celestron 14 so that in five minutes one person can demount this 108-lb. instrument into components weighing no more than 45 lbs. each. This telescope—with optional tripod, equatorial wedge and other accessories—will travel with you in your compact car to a remote star-party site where you will remount and align this massively stable instrument in minutes.

VERSATILITY . . . The Celestron 14 offers sufficient aperture for such research station tasks as photometry, interferometry and spectroscopy . . . a Schmidt configuration and oversized 50mm star diagonal that with optional giant Erfle eyepiece makes it the optimum 50X Richest Field Patrol Telescope . . . a combination of portability and large aperture that's perfect for the advanced amateur astronomer . . . and a simplicity of operation that lets the educator concentrate on education.

This telescope is also part of the most advanced astrophotographic system ever offered in its aperture range, the Celestron 14 equipment group—a system with capabilities ranging from fundamental lunar and planetary photography . . . through chilled-emulsion photography . . . to professional-aperture Schmidt Camera photography.

Celestron 14 Photos

The Hercules Cluster (M 13)



The Ring Nebula (M 57)

The Trifid Nebula (M 20) with Tele-Compressor

Celestron® 14

For the Advanced Amateur Astronomer
University Observatory
Science Center

Celestron 14 Schmidt-Cassegrain Telescope

Educators please note — A large observatory telescope installed in a permanent dome on your campus will multiply the student interest in your astronomy program, enhance the prestige of your institution and create community interest. But what about arguments of the tremendous initial investment making it prohibitive and wasted instrumentation if installed under adverse city light conditions encountered on most campuses? These arguments instantly disappear if you are considering the Celestron 14—it is the world's best buy for the college or university observatory. Its aperture is sufficiently large for research assignments. Yet it is a portable telescope so that you may take student groups to remote dark sky locations for study of the numerous faint nebulous objects easily within the grasp of this instrument.

The North America Nebula and the Pelican Nebula with the Celestron 8-inch Schmidt Camera

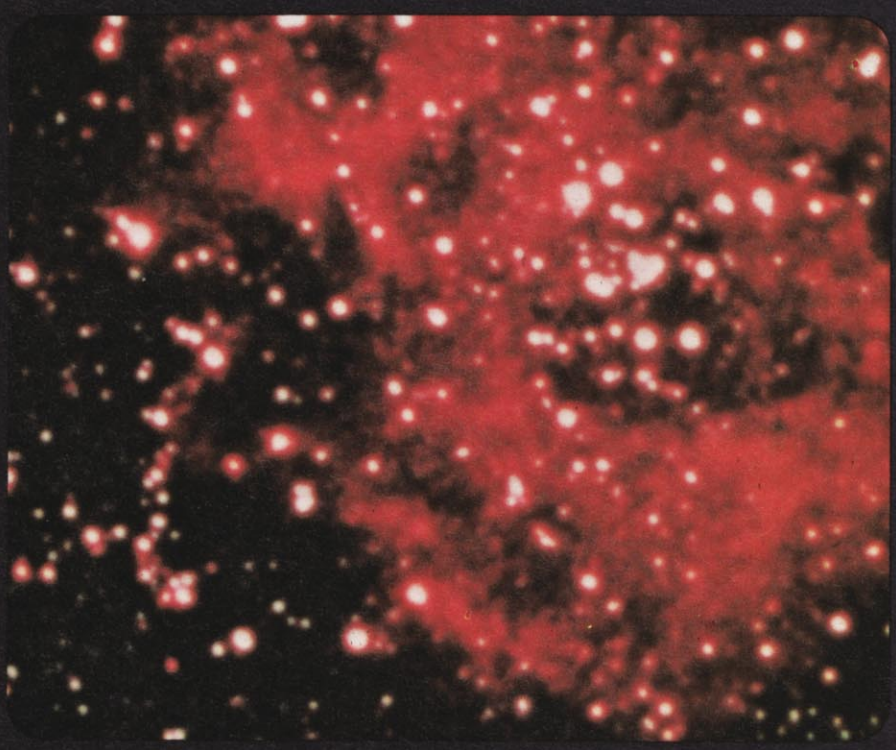
The Andromeda Galaxy and satellite galaxies with the Celestron 14-inch Schmidt Camera

Orion Nebula — Celestron 14 and Cold Camera

Trifid Nebula — Celestron 14 and Cold Camera

Comet Kohoutek — 5½-inch Schmidt Camera

Horsehead Nebula — 5½-inch Schmidt Camera



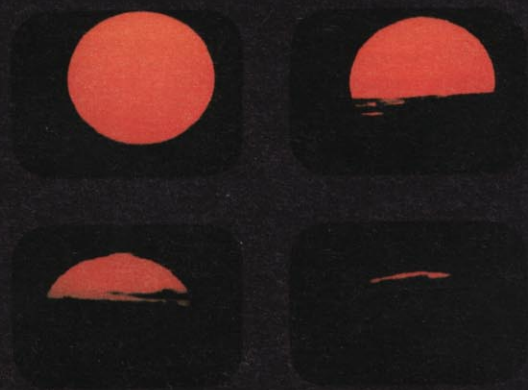
Rosette Nebula — 5½-inch Schmidt Camera

While black-and-white film is more frequently used in scientific research in astronomy, nothing is more rewarding to the amateur astrophotographer than conducting his own color slide show before a Jr. Science or Boy Scout group using his own slides of astronomical subjects. And certainly with his Celestron and using snap-shot procedures he can capture on film the pastel reds, yellows, blues and greys of the belts of Jupiter or the bizarre reddish cast of the Moon in total eclipse. But the miracle of color astrophotography with this equipment becomes apparent when he can include in his slide show carefully-guided time exposures of deep-space objects. Photos that reveal faint hues and tints that are beyond the visual reach of even the world's largest telescopes. Only a few short years ago, deep-space color photography was just a dream even for professionals with the large research telescopes. Recent commercial availability of good color slide film and techniques of shortening the long exposure times have changed this. Celestron equipment and accessories for this purpose include: A tele-compressor system that increases the photographic speed of the Cassegrain telescope thereby reducing the exposure time for a given film density by a factor of four. A Cold Camera that extends the low light threshold level of certain high-speed films thereby making them practical for astrophotography. Fast Schmidt Cameras that have sky-flood limits of 20 to 30 minutes even with relatively slow color films . . . In short, the amateur astrophotographer now has at his disposal the capability of capturing on film in natural color the soft red glow of the North American Nebula, the green and red filamentary structure of the Crab Nebula, the blue hues of the Dumbbell Nebula, or the blue spiral arms of the Andromeda Galaxy twined around its glowing yellow core.

The Lagoon Nebula — Celestron 14 and Cold Camera

Orion Nebula — 14-inch Schmidt Camera

The Rings of Saturn — Celestron 14



The Setting Sun — Celestron 8

Celestron — Challenge the Leader

Selecting a Telescope? Your question might well be . . . I'm a complete novice but want the best value for my money — something I won't have to throw away if my interest expands. How do I judge which instruments are really good and which manufacturer's claims are grossly exaggerated? If you were an experienced amateur astronomer you would already know that a Celestron Telescope is the most coveted and recommended in its aperture range. So how do you determine how well a given telescope will match your interest requirements? A few simple phone calls will place at your disposal the experience of experts in this field. Contact a professional astronomer, a college professor in astronomy, a planetarium director. These people will be glad to assist you. Seek out one of the local astronomical groups and go to one of their star parties where you can compare various telescopes side by side. You will certainly find more Celestron telescopes at one of these meetings than any other make. Be sure to compare the convenience of controls and the ease of locating a given deep-sky object with each instrument. Tap the mount to see how quickly the vibration settles out. Compare visually . . . How well is the globular cluster M 13 resolved? Does the delicate crepe ring of Saturn show? How much filamentary structure in the Orion Nebula is displayed? If you wish, we will send you a list of the hundreds of colleges and universities using Celestron Telescopes as their primary teaching instruments.

Celestron Pacific

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