# CROSS OPTICS



**Price $1. No. America, $2.– elsewhere**

**COMPLETE CATALOGUE**

# B price list

Clavé Products

| | |
|---|---|
| 1 1/4" Eyepieces | page 17 |
| (SEE SPECIAL OPPOSITE PAGE) | |
| 3 and 4mm focal length | $105. |
| 5 and 6mm focal length | 100. |
| 8, 10, 12, 16, 20, 25mm F L | 97. |
| 30mm focal length | 117. |
| 35mm focal length | 125. |
| Super Barlow (2.34X) | 80. |
| 2X Barlow | 68. |
| 2-INCH CLAVE EYEPIECES | page 20 |
| 30mm FL Clavé Plössl eyepieces | $215. |
| 35mm and 40mm focal lengths | 234. |
| 45 and 55mm focal lengths | 250. |
| 65 and 75mm focal lengths | 258. |
| ILLUMINATED RETICLE EYEPIECES | pg 20 |
| OE-12 | 281. |
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| Clavé Focussers | page 23 |
| POV Focusser | $429. |
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| Clavé Right-Angle Devices | page 24 |
| RP 27 | $370. |
| DH-53 | 410. |
| RC-50/2 | 530. |
| Clavé Objective Lenses | page 25 |
| OA-60 | $387. |
| OA-80 | 748. |
| OA-100 | 965. |
| OA-130 | 1570. |
| OA-150 | 2700. |
| OA-200 | 8300. |
| OT-60 | 344. |
| OT-80 | 690. |
| OT-100 | 865. |

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Please send the following to the address listed on the reverse:

| QTY | ORDER NUMBER OR DESCRIPTION | AMOUNT |
|---|---|---|
| | | |
| | Subtotal | |
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| | Add $2 for postage and handling for orders of $24.99 or less | |
| | TOTAL ENCLOSED OR CHARGED | |

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* Each pair comes with the tripod adapter, and of course the leather case, straps and dust caps.

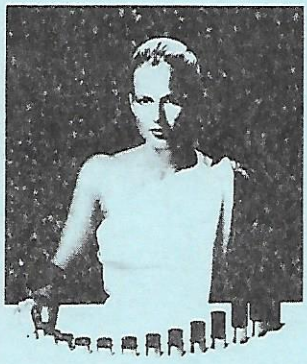
* Although the 11 X 80mm is an excellent wide field and deep sky binocular, it can also be used as a terrestrial binocular.

* The 30 X 70mm is an excellent pair for terrestrial use, but it can also be used as an high power astronomical binocular.

* Note other specifications on page 1 of our catalogue.

* UNTIL DECEMBER 31, 1980---11 X 80mm--$189.95
30 X 70mm---175.95


# WAIT NO MORE!



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★ Choose any *one* 1¼" *Clavé Plössl* of 3, 4, 5, 6, 8, 10, 12, 16, 20, or 25-mm focal length, and

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|---|---|---|
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# INTRODUCTION

Cross Optics was established in the spring of 1975 in New Mexico, U.S.A. At that time the company purpose was to bring the superlative products of Établissements S. R. Clavé to the attention of the world's observational astronomers. That the efforts of Cross Optics have been successful is attested by the fact that the increasing ocular production of Éts. S. R. Clavé is only marginally above, and occasionally below, the now very great increasing world demand. Cross Optics is pleased to represent Éts. S. R. Clavé in North America for astronomical products.

Cross Optics designs and manufactures optical components and telescopes of high precision to fulfill astronomical and industrial research requirements. We are pleased that optical components of our manufacture are in use around the world.

Practically from its inception, Cross Optics' horizons expanded beyond telescopic components to complete telescopes. We are pleased now to offer a line of instruments encompassing a large range of astronomical requirements and budgets. Beginning with our fine giant binoculars, one model of which is virtually a "stereoscopic" hand-held wide-field Richest Field Telescope (11X80mm objective, 4.5° field of view), the range extends to the large aperture transportable Nustar 14 telescope and the even larger Nustar 24, an exceptional value in a research telescope.

Cross Optics is dedicated to high quality optical performance and fair play. Truly astronomical quality optics are labor intensive, and craftsmanship should have its just reward. Someone has to care a great deal to make a good telescope. We do.

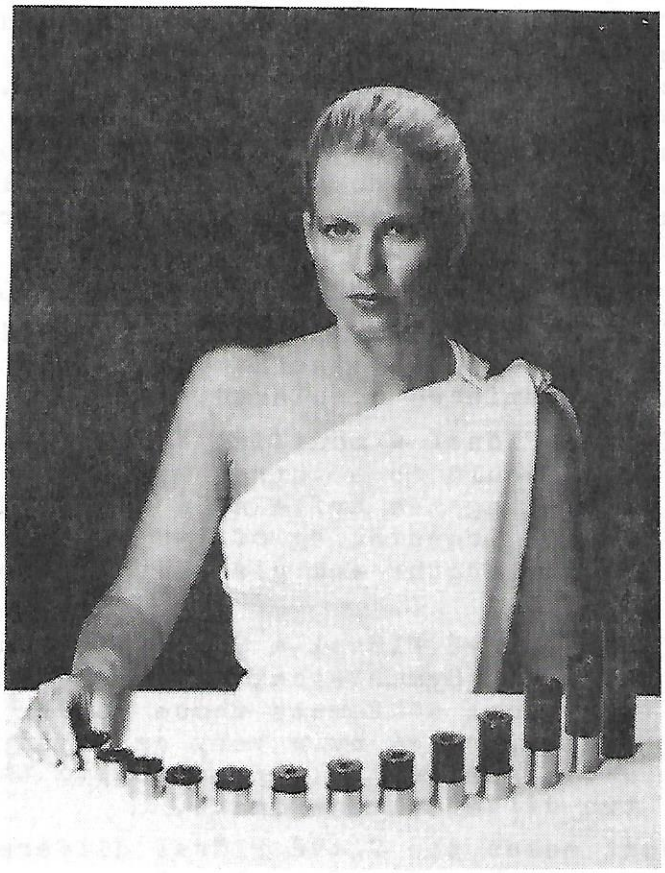
May we be of service?

CROSS
OPTICS

# CLAVÉ PRODUCTS

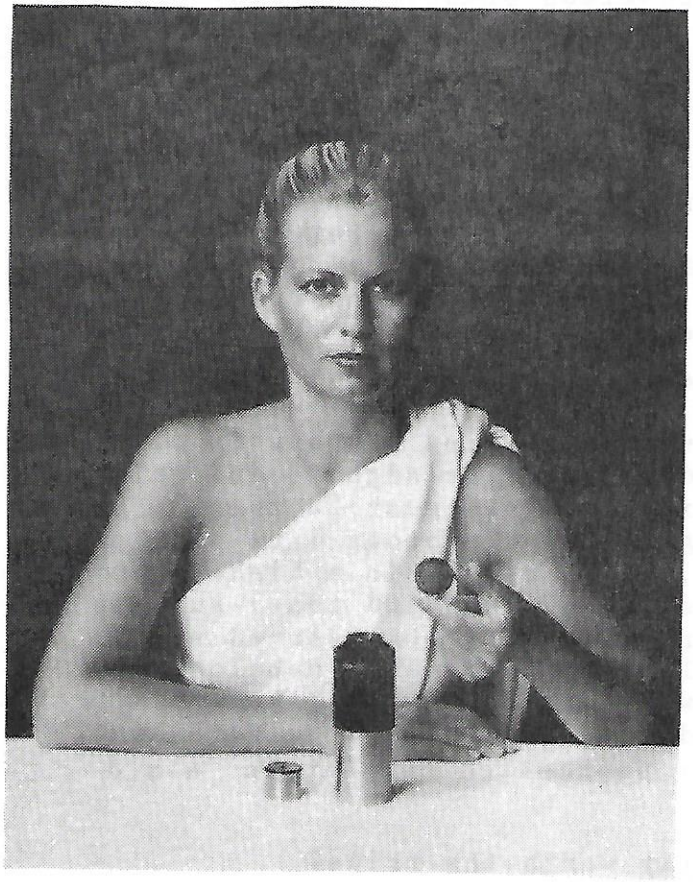
In the picture at right, you see from left to right, the 3mm through 35mm focal length 1 1/4" Clavé Plössl eyepieces. The 2X Clavé Barlow is next to the 35mm focal length eyepiece.

p17



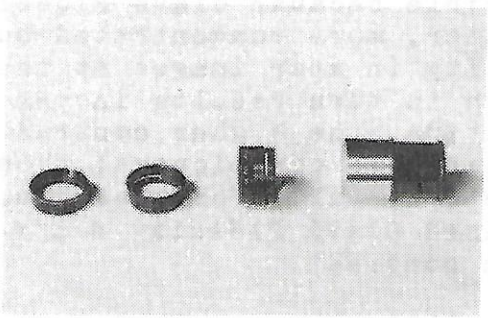
Below are illustrated the largest and smallest Clavé Plössl eyepieces, and a Clavé Filter. You see that the Clavé Filter fits on the eye end of <u>any</u> Clavé eyepiece.

2"-p20 . Filter-p21



Illustrated below are the Type-2 Filters (one is at left), the F-1 Adapter(to the right of it), then you see the Filter and Adapter together. The Adapter push-fits into the 1 1/4" Clavé eyepieces.

p21



# WHY CLAVÉ PLÖSSL?

Établissements S. R. Clavé, established in 1936 by Monsieur Serge Clavé, is perhaps the best known aerospace optical maker in France. With a large staff and modern test and manufacturing equipment, Éts. S. R. Clavé betters the state-of-the-art in precision custom and production optical work. Examples of Clavé diversity are one meter optical windows for wind tunnels, and periscopes for nuclear reactors. However, the products for which Clavé is best known among astronomers, are the Clavé Plössl eyepieces. Astronomical optics are only a small part of Clavé's manufacturing interests.

## THE "WHY?" OF THE CLAVÉ PLÖSSL EYEPIECE

Is a Plössl an extinct flying reptile?

No, Plössl is the name of an optical designer who designed a genre of eyepieces (oculars).

Is the Plössl a modified Kellner?

That would be stretching the word "modified" to the point of including the Erfle as a modified Kellner. Actually, the Clavé Plössl, consisting of two very closely spaced achromats of different focal lengths and glasses, is closely related to the Symmetrical design.

Is the Clavé Plössl a Symmetric ocular?

No. The Symmetrical design, as its name implies, consists of two identical achromats whose convex crown elements face each other and are separated by a very small air-to-glass space. The Clavé Plössl, while similar in appearance to the Symmetrical design, consists of two different achromats.

What makes the Clavé Plössl different from other Plössls and other makes or brands of oculars?

Clavé begins with an excellent design and adds craftsmanship, time, sophisticated test equipment, and rigid quality assurance procedures. Clavé oculars are the only ones on the American market whose lens components' surfaces approach the finest primary optics in degree of smoothness and control of figure. Clavé expertise in research and aerospace optics comes to bear here.

Can I really see any difference in performance between a Clavé Plössl and brand "X"?

Experienced variable star observers report gains of between 0.4Mv and 0.75Mv compared to top brand name oculars. For significant gains, a telescope yielding diffraction limited imagery must be used. This is possible because Clavé Plössls image stellar photons into smaller, tighter, more concentrated bundles, which result in a higher photon density in star images at the eye's "film" (rod and cone) surface, which in turn results in perception of formerly unobserved stars. In addition, the higher contrast of Clavé Plössls makes nebulosities appear more conspicuous; those in which color can be detected appear more colorful. For years lunar and planetary observers have highly praised Clavé Plössls for their unexcelled resolution and high contrast.

Is the difference in performance <u>really</u> worth the price?

For thousands of observers around the world, the answer has been unequivocally "Yes!" Considering that 0.75Mv gains is like stopping an 8-inch telescope UP (!) to 10 1/2 inches, the gain can be measured in dollars.

What guarantee do I have that I will be satisfied?
If you are not satisfied, your money will be returned, provided that the ocular is returned in original condition. What could be fairer?

Are Clavé Plössl lenses coated?
Yes, all air-to-glass surfaces are multi-coated to ensure maximum light transmission and highest contrast. Clavé Plössl oculars were the first on the American market to have multicoatings.

What does "parfocal" mean?
Coming to the same focus. When one eyepiece in a parfocal series is interchanged with another member of the series, even though giving higher or lower magnification, little or no refocusing is necessary.

My observing interests are varied; can you supply both high and low magnifications?
Whether your telescope is a 61-inch f/45 Cassegrain, like the Lunar and Planetary Laboratory's, or a 6" f/3.2 R.F.T., we have the focal length oculars to efficiently suit your needs. There are seventeen different focal lengths to choose from, from 3mm to 75mm. These make the largest parfocalized series of oculars in the world.

But I need wide field eyepieces. What can Clavé offer?
Clavé Plössls are the ONLY wide field series (3mm to 75mm focal length) of oculars made anywhere on Earth. Clavé Plössls are the only oculars that have at least the advertised apparent fields. Eyepieces of other manufacture may advertise 50° but actually delivery only 43°, or advertise 45° but deliver 36°. Considering true actual sky coverage, one of our 48° apparent field Clavé oculars actually covers 78% more sky area than other makes advertising 45°, but delivering 36°. The difference Clavé makes is like the difference between a picture window and a porthole. Clavé Plössl: the only high definition wide field ocular.

Suppose I wear eyeglasses?
Comfortable observing, as well as wide field observing, requires that eyeglasses not be worn. Simple refocussing corrects most shortcomings of the eye. This is not true of astigmatism, which requires cylindrical correction such as eyeglasses provide; a fairly high magnification with an effective exit pupil of 1mm or smaller makes eyeglasses unnecessary even for astigmatism.

Who buys Clavé Plössl oculars?
Amateur and professional observational astronomers who value the utmost performance their telescopes can provide. Observers who value galactic spiral arms, vivid pink and green colors in M42 and other diffuse nebulae, the central stars (15Mv) of the Ring Nebula, inner sanctum variables, Sirius B and other close unequal binaries, Encke's division, and markings on Ganymede and Titan. Most of Earth's observatories are equipped with Clavé Plössls. A partial list includes Cerro Tololo Inter-American, Harvard College, Haute-Provence, Lowell, Lunar and Planetary Laboratory, McDonald, Meudon, Table Mt. (JPL), and U.S. Naval Observatories. These observatories are known world-wide for outstanding observational achievements in stellar and planetary astronomy.

# WHAT OUR CUSTOMERS THINK

"Anyone who knows anything about optics, eyepieces, etc. knows the superiority of the Plössl eyepiece, period. I now own a Plössl which gives utterly perfect images over the entire extent of the field; an amateur truly gets what he pays for. Unfortunately, most astronomers, amateurs and professionals alike must see to believe...I own two Brandons...The images given by your Clavé Plössl oculars are completely unsurpassed by any other design or brand eyepiece that I have ever examined...Plössls are definitely a superior design. Fellow astronomers agree 100% at first view. Clavé is the best!"
James Kousbaugh, Tacoma, Washington

## IS IT TRUE?

**Once you have poured your time, effort and money into acquiring a fine telescope, you may find yourself using Kellner or orthoscopic eyepieces. After all, it's the primary optics alone that count. Right? How much difference can the eyepiece make? Read the following unsolicited reactions to Clavé Plössl eyepieces:**

"I thought you would be interested in knowing about the ego trip I had at Roger Tuthill's seminar on April 24, 1976, at Cranford, New Jersey. At the evening star party there were more than two dozen telescopes set up by the participants including a number of Celestron 8's and Dynamax. The star party began with approximately 70 people viewing Saturn. I noticed that there was consistently a minimum of four people waiting in line to look through my Celestron 8. Another Celestron 8 owner asked me, 'Why is your scope different from mine in performance?' I guessed that it might be the Clavé eyepieces that I bought from you folks. We used my 12-mm. and 6-mm. eyepieces on the other Celestron 8 and to our surprise we got the same performance out of his scope that we had from mine. Obviously, the eyepieces were the cause of my high performance. For over 1½ hours, as word spread about the performance of my scope, I had people standing in line at all times. Many observations about, 'This is the best sight of the night, and this is comparable to performance of the 24-inch Group 128 Cassegrain' — an exaggerated statement but great for an ego trip. Later, we split the binary star Castor, and to the amazement of a number of people they could clearly see black between the two stars which were separated by two seconds. We finally compared a 12-mm. Vernonscope Brandon eyepiece with my 12-mm. A group of five people would use eyepieces without knowing which eyepiece they were using. It was unanimous that the Clavé was superior."
**— B. B., New York State**

"I have had a 25-mm. Clavé Plössl for some years now, and find it by far the best [eyepiece] that I've ever used. I would not part with it." **— J. J. Frisch, Coplay, Pa.**

"First, I would like to give praise to the two finest eyepieces I have ever used, the 3-mm. and 25-mm. Clavé Plössls. I tested these eyepieces against similar focal length Kellners, orthoscopics, and Erfles, and found superior image quality, 0.75 magnitude fainter detection of stars, and finer color correction throughout the entire field of view. I am an owner of just about *every competitive* [writer's emphasis] eyepiece sold in *Sky and Telescope* magazine and I repeat, I have really found what I consider to be truly custom — worth the price — superfine oculars in Clavé Plössls. My instrumentation ranges from 3-, 4-, and 6-inch refractors to a 20-inch Newtonian. I have been an observer for 20 years, and not until now have I realized the potential of my instruments." **— Michael Palermiti, Marcellus, N. Y.**

**Clavé Plössl eyepieces have been the specified choice among professional astronomers for years. Now state-of-the-art Clavé Plössl eyepieces are conveniently available to both professional *and* amateur astronomers.**

## It's Still True

**You may have heard or read that Clavé Plössl eyepieces produce images of unparalleled beauty, but is there *really* a noticeable difference between them and other well-known makes of oculars? Read the following unsolicited reactions to Clavé Plössl eyepieces:**

"I have had a few months now to evaluate the 20-mm. Clavé Plössl eyepiece that I purchased a while back. Without a doubt it gives finer star images and darker background than either my Brandon or Telescopics eyepieces, which to date I've considered superior with my scope (16" f/5 Newtonian). In addition, planets (Jupiter) definitely appear to have better contrast and finer detail than with any other eyepiece tried to date. You are to be commended for distributing a superior product. Well worth the money."
**— A. W. Steinbrecher, N. Y.**

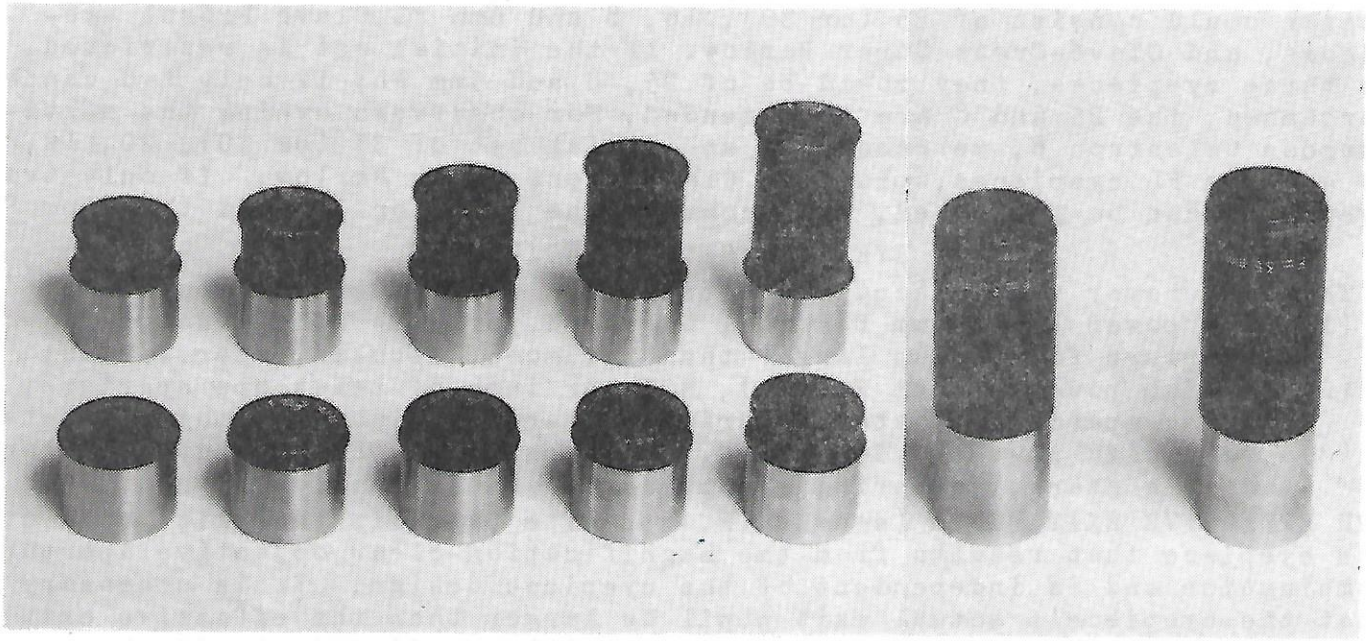
"I am sending in an order for five of the Clavé Plössl eyepieces and the 2x Clavé Barlow. There are a number of reasons for my doing this. One is because of the superb performance I received from the 10-mm. Plössl from you. I have used it in conjunction with a 16-mm. König eyepiece, which is also multi-coated, and have observed for the first time all of the Messier objects but two from July, 1976, to November 1, 1976. Looking at most of the galaxies and globular clusters with both eyepieces, I observed no apparent dimmer view with the 10-mm. eyepiece in most cases. Almost each note indicates that the 10-mm. gave the best view. The only important exceptions were extremely dim galaxies and large galactic clusters. Another reason for finally deciding upon your eyepieces after about 1½ years of deliberation, was, of course, that they are now in the standard 1¼" format. However, the most important reason is the great advice you gave in the three extensive letters you wrote to me.... The 10-mm. Plössl is the only eyepiece I have ever used which has the apparent field claimed for it." Later, after receipt of order: "Now at long last I can rest assured that I have the best money can buy. I tried them out last night. It is a delight to experience an eyepiece such as the 30-mm., which has a relatively wide field with perfect (pinpoint) star images from edge to edge."
**— Norman L. Happe, Ind.**

"I recently received my first Clavé Plössl ocular and last night had my first look! Wow! You may now consider me an ardent fan. My doubts about the extravagant testimonials in your ads are completely shattered. I made my own comparison tests and the Plössl won 'going away.' I had always been happy with the performance of my Celestron, compared to others, but now I am deliriously happy. You haven't seen Jupiter's zones and shadow transits, nor Orion's dust lanes until you've looked through a [Clavé] Plössl. I'm now saving all my 'hobby money' to extend my current oculars and eventually replace them with Clavé Plössls from Cross (and you may quote me on that!)." **— Harry W. Miller, Ill.**

**Why wait? Whether your telescope is by Boller and Chivens or a homebuilt, Clavé Plössl will improve your fine telescope's performance.**

# CLAVÉ PLÖSSL EYEPIECES 

World's Finest Eyepieces



**FEATURES:**

* State of the art imagery fidelity
* Faintest possible limiting magnitude
* Truly wide field
* Twelve focal lengths
* Precisely parfocalized
* Multicoated
* Precision American standard 1 1/4" O.D. stainless steel barrels

*26% larger actual sky coverage (area) than ordinary 40mm FL Kellners

1 1/4" Clavé Plössls

| FOCAL LENGTHS | APPARENT FIELD | FIELD STOP DIAMETER |
|---|---|---|
| 3mm | 48° | 2.7mm |
| 4mm | 48° | 3.6mm |
| 5mm | 48° | 4.5mm |
| 6mm | 48° | 5.4mm |
| 8mm | 48° | 7.1mm |
| 10mm | 50° | 9.4mm |
| 12mm | 50° | 10.7mm |
| 16mm | 50° | 14.2mm |
| 20mm | 50° | 17.8mm |
| 25mm | 50° | 22.5mm |
| 30mm* | 48° | 26.7mm |
| 35mm* | 42° | 26.7mm |

SUPER BARLOW: The Clavé Barlow lens is parfocal (at 2X) and multicoated and provides two magnifications, 2.34X and 2X. With a 12mm FL ocular, the Barlow gives the same image quality as the equivalent of 5 and 6mm FL Clavé Plössls, yet with substantially greater eye relief. Internally threaded and blackened to eliminate reflections. Optical plan: achromat, f=-113mm, p=+57mm, p'=+114mm. The world's finest Barlow lens. (2.34X Barlow is the 2X Barlow plus F-2 Adapter.)

ADAPTABLE TO: VERNONscope Filters, Optica b/c Filters and our own TYPE-2 Filters. See section on Adapters for details.

CELESTRON OWNERS: Unlike other makes of oculars and Barlow lenses, Clavé Plössls and the Super Barlow are compatible with the Celestron Telextender.

# 18 EYEPIECE RECOMMENDATIONS

(See also the "Eyepiece Selection Guide")

AN INITIAL WORKING SET of four eyepieces for an amateur's 6-inch f/8 Newtonian could consist of 25 (or 30), 16, 8 and 6mm FL Clavé Plössl eyepieces, and Clavé-Cross Super Barlow. If the initial set is restricted to three eyepieces, they could be of 25, 8 and 5mm FL; if only two can be purchased, the 25 and 8 are recommended. For observers owning the multipurpose Celestron 8, we recommend an initial set of 35 (or 30), 20, 12, 10 and 8mm FL eyepieces, plus the Clavé-Cross Super Barlow. If only two eyepieces can be purchased, we recommend the 30mm (or 35) and the 10mm FL.

AN EYEPIECE SET TO BEGIN WITH

The astronomer should acquire eyepieces in this order of importance:

(1) low power (3 to 6mm E.E.P.), 8X to 4X per inch of telescope aperture for fields larger than the moon, nebulae, star fields;

(2) medium power (0.8mm E.E.P.), 32X per inch of telescope aperture; for comparison of stars, variable stars, optimum for most planets;

(3) very high power (0.5mm E.E.P.), 50X per inch of telescope aperture; double stars, centering of optics, near maximum for planets.

THE EFFECTIVE EXIT PUPIL (see E.E.P.-opposite page) is the exit pupil of the eyepiece that results from the magnification-clear objective aperture combination and is independent of the eyepiece design. It is necessary that the eyepiece's actual exit pupil be larger than the effective exit pupil, or the telescope's clear aperture will be effectively diaphragmed down from the eyepiece end. The limit as to how large the E.E.P. can be is set by the observer's own eye pupils, and is usually accepted to be 7mm (in diameter); some observers, however, have pupils that expand to more than 8mm. It is best, in the interest of comfort, if the E.E.P. is smaller than the eye's pupil or there will be no possibility of movement by the observer without vignetting. An E.E.P. of about 5mm is useful for a very wide field day/night low power eyepiece. On the other hand, an E.E.P. of 0.90-0.80mm is required to make visible detail at the telescope's diffraction limit under optimum illumination-contrast conditions. Still smaller E.E.P.'s (higher magnifications) are required for observing "limit" detail in many subjects. Effective Exit Pupil of the Eyepiece is $\frac{\text{Telescope Objective Diameter}}{\text{Magnification}}$. Example: Exit Pupil = $\frac{203\text{mm}}{200\text{X}} \approx 1\text{mm}$

Longer focal length eyepieces have greater eye relief, allowing more latitude in the placement of the eye near the eyepieces. Slower systems permit using long focal length eyepieces for high magnifications (small E.E.P.'s). Therefore, slower systems (f/15, f/20 etc.) permit more comfort in using higher magnifications. Unfortunately, these same instruments do not have the capability of the RFT mode with any existing eyepieces. A useful compromise may be achieved by using a Barlow lens, which can effectively turn a moderately fast system (f/6-f/8) into a medium to slow system (f/12-f/16 or f/14 -f/19) depending on whether the 2X or 2.34X Barlow lens option is used.

There's more to choosing an eyepiece than meets the eye. A poor eyepiece can cause loss of definition and contrast on-axis and across the field, false color, distortion in extended objects, and asymmetric or expanded star images, with resultant loss in effective light gathering power. In actual comparison performance tests, the Clavé Plössl has shown itself superior to all known eyepiece types, including imported and domestic top name brands. The Clavé Plössl: a superior design produced with superior craftsmanship.

| MAGNIFICATION RANGE | APPLICATION | E*ç EP mm | f/4 FL | f/5 FL | f/6 FL | f/7 FL | f/8 FL | f/10 FL | f/11 FL | f/15 FL | f/16 FL | f/20 FL | f/25 FL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | FOCAL RATIO OF TELESCOPE / EYEPIECE FOCAL LENGTH IN MILLIMETERS | | | | | | | | | | |
| VERY LOW POWER | Richest (star) Field Telescope (RFT) observations; the most stars per view. Widest useable unvignetted field, assuming the observer's pupil expands to at least 7mm | 7.* | (*6.2) 25 | 35 | (6.7) 40 | (6.4) 45 | (6.9) 55 | (6.5) 65 | (6.8) 75 | -- | -- | -- | -- |
| | | | *Unless indicated in parentheses, figures are for EEP (*ç). | | | | | | | | | | |
| LOW POWER | Wide field for viewing star fields, Earthshine, nebulae as well as daytime terrestrial viewing. | 5. | 20 | 25 | 30 | 35 | 40 | 45 (4.5) | 55 | 75 | 75 (4.7) | 75 (3.8) | -- |
| | | 3. | 12 | 16 (3.2) | 20 (3.3) | 20 (2.9) | 25 (3.1) | 30 | 35 (3.2) | 45 | 55 (3.4) | 55 (2.8) | 75 |
| MED. POWER | Studying variable stars, large area viewing of lunar features, viewing large nebulosities. | 2. | 8 | 10 | 12 | 16 (2.3) | 16 | 20 | 25 (2.3) | 30 | 35 (2.2) | 40 | 55 (2.2) |
| | | 1.5 | 6 | 8 (1.6) | 10 (1.7) | 10 (1.4) | 12 | 16 (1.6) | 16 (1.5) | 20 | 25 (1.6) | 30 | 35 (1.4) |
| HIGH POWER | General use magnification normally most effective for planets, Moon, and study of globular star-clusters (.58 EEP excellent for Mars under optimal conditions). | 1.0 | 4 | 5 | 6 | 6 (.86) | 8 | 10 | 10 (.91) | 16 (1.1) | 16 (.90) | 20 | 25 |
| | | .75 | 3 | 4 (.80) | 5 ( 83) | 5 (.71) | 6 | 8 (.80) | 8 (.73) | 12 (.80) | 12 | 16 (.80) | 20 (.80) |
| | | .58 | 5 (.63) +2X B | 3 (.60) | 4 (.67) | 4 (.57) | 5 (.62) | 6 (.60) | 6 (.55) | 8 (.54) | 10 (.63) | 12 (.60) | 16 (.64) |
| VERY HIGH POWER | Precise collimating of telescope optics-observing close double stars, certain planetary details under perfect conditions, detail on satellites (Ganymede etc), viewing the Airy disk. | .50 | 4 +2X B | 5 +2X B | 3 | 3 (.43) | 4 | 5 | 5 (.46) | 6 (.40) | 8 | 10 | 12 (.48) |
| | | .38 | 3 +2X B | 4 +2x B | 5 (.42) +2x B | 5 (.31) +2X B | 3 | 4 (.40) | 4 (.36) | 5 (.33) | 6 | 8 (.40) | 10 (.40) |

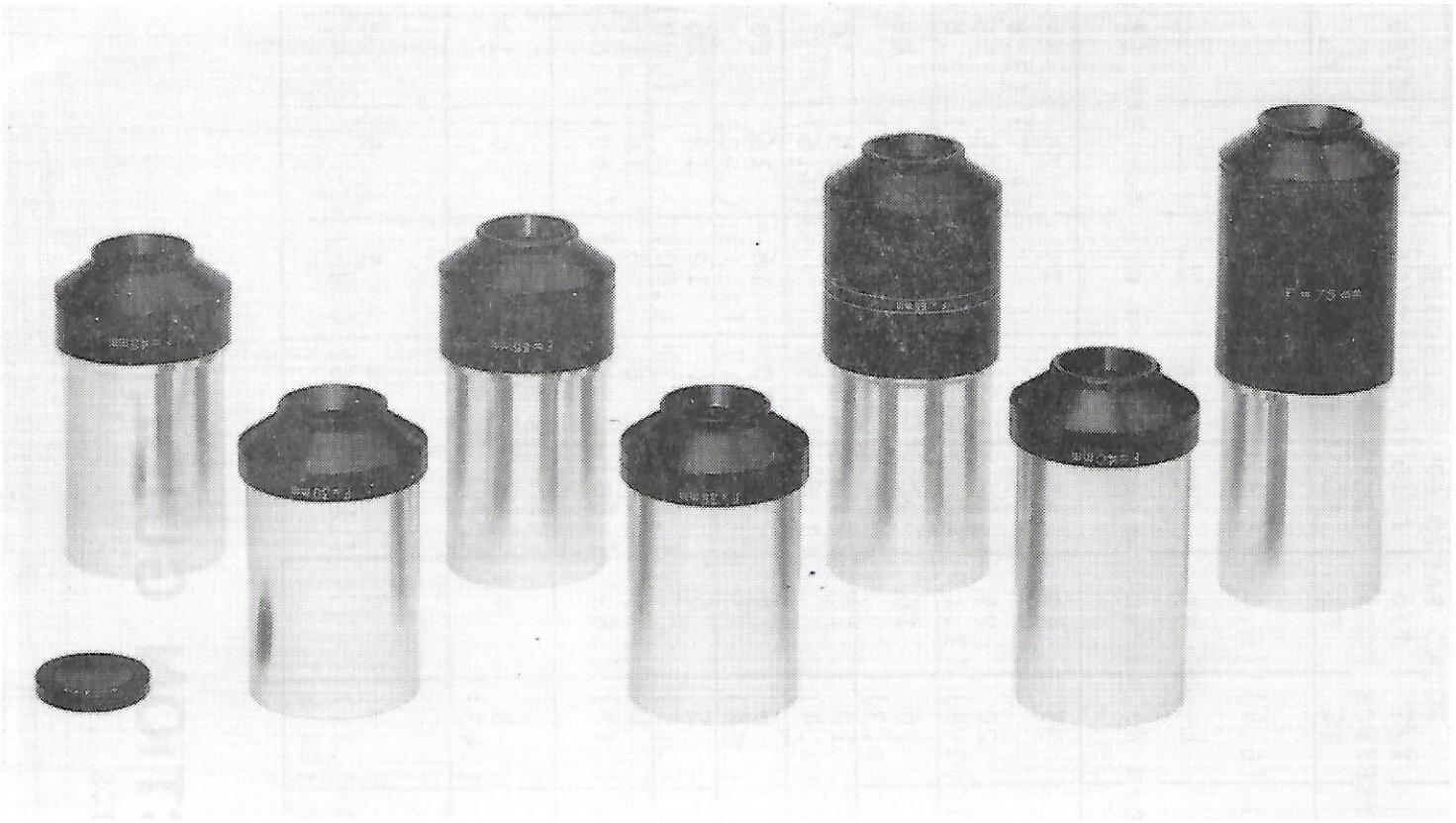
*ç Effective Exit Pupil

# EYEPIECE SELECTION GUIDE

CROSS OPTICS

# CLAVÉ PLÖSSL EYEPIECES

World's Finest Eyepieces

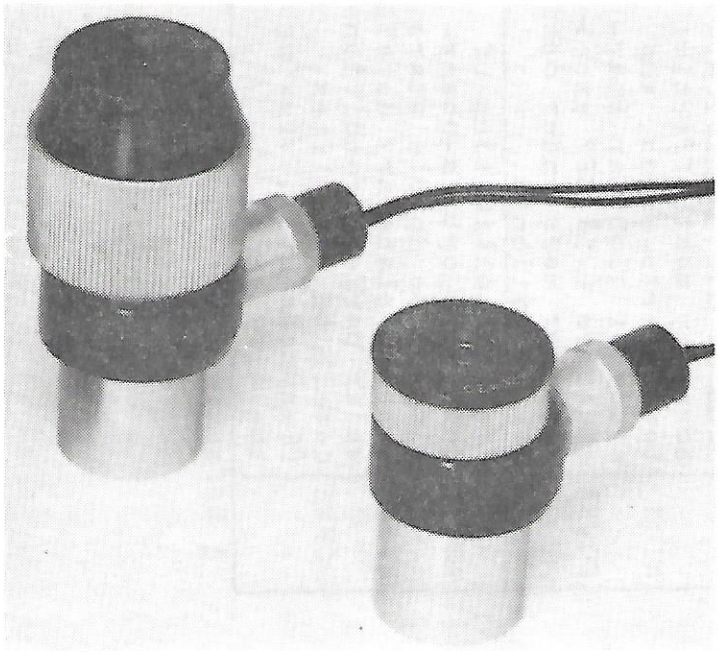


2-inch O.D. Barrel Series (see page 17 for 1 1/4" Series)

FEATURES:

* State of the art imagery fidelity
* Faintest possible limiting magnitude
* Truly wide field
* Seven focal lengths
* Precisely parfocalized
* Multicoated
* Precision stainless steel 2-inch barrels

| FOCAL LENGTH | APPARENT FIELD | FIELD STOP DIAMETER |
|---|---|---|
| 30mm | 48° | 26.7mm |
| 35mm | 48° | 31.2mm |
| 40mm | 48° | 35.7mm |
| 45mm | 48° | 40.1mm |
| 55mm | 42° | 42.1mm |
| 65mm | 37° | 43.5mm |
| 75mm | 32° | 43.5mm |



ILLUMINATED CROSS-HAIR EYEPIECES

These Clavé Plössl eyepieces utilize an ingenious light piping cross-hair design that permits viewing a dark sky background. Excellent as a finder eyepiece. Available in 12mm or 25mm focal lengths. Power source not provided; designed for 1.5 volt battery. Order OE-12 or OE-25.

# FILTERS

For Improved Lunar and Planetary Definition
For Prime Focus Photography of Nebulosities

TYPE-2 WRATTEN FILTERS: Available in 16 Wratten type transmissions. They have 1-inch clear aperture optically plane parallel glass for wide field visual fields or direct "prime focus" filter photography of star fields and nebulosities. Silver engraved precision made metal mounts indicate Wratten color code values and mean far greater convenience compared to non-engraved filters. These filters can be used on Clavé 1 1/4" eyepieces by utilizing either the F-1 or F-2 Filter Adapter. The F-2 Adapter may also be used with any 1 1/4" eyepiece. Transmissions are:

| | | |
|---|---|---|
| 8-Light Yellow | 21-Orange | 56-Light Green |
| 11-Yellow Green | 23A-Light Red | 58-Green |
| 12-Yellow | 25A-Red | 64-Blue-Green |
| 15-Deep Yellow | 38A-Blue | 80A-Medium Blue |
| 30% Transmission Polarizer | | 82A-Light Blue |
| Double 30% Transmission Polarizer | | 47B-Violet |

CLAVÉ FILTERS: These ingeniously made filters snap on to the eye end of any Clavé eyepiece (see picture, page 13). These mounted optically flat glass filters set the international standard for quality.

| | |
|---|---|
| FB-Blue | FR-Red |
| FG-Green | FN/10-Neutral Density Filter (10%) |
| FY-Yellow | FN/20-Neutral Density Filter (20%) |
| FO-Orange | FN/50-Neutral Density Filter (50%) |

DEEP-SKY FILTERS: Available as Photo-Visual and Visual. The Photo-Visual Filter optimizes transmission in the red spectrum where most nebula light is located, as well as the blue-green area where hydrogen-beta and doubly ionized oxygen lines are located. Transmission of hydrogen-beta, doubly ionized oxygen and hydrogen-alpha is as high as 85%. Blocking transmission is approximately .02%, between 5400Å and 6200Å, which provides exceptional contrast. The Photo-Visual Filter makes possible the most rapid photographic exposures of any light pollution blocking interference filter made. The Visual Filter is especially well suited for medium to highly light polluted areas and produces beautifully striking images of emission nebulae, which appear as celestial rubies.

# ADAPTERS

F1-PLOSSL FILTER ADAPTER: This small threaded ring-type adapter pushfits into the telescope end of the stainless steel barrel of the Clavé Plössl eyepieces, and is threaded for our Wratten TYPE-2 Filters. (See page 13.)

F2-ALL EYEPIECE TO FILTER ADAPTER: Looking like a shortened Barlow tube, this adapter adds some (1.5") back focus distance, so may not be compatible with all Newtonians. This allows using the TYPE-2 Wratten filters with all 1 1/4" eyepieces and Barlows. 2.34X Super Barlow = 2X Barlow plus F2.

FFV-PLOSSL TO VERNONSCOPE FILTER ADAPTER: Looks like the F1 Adapter, but is threaded to accept the VERNONscope filters.

PLOSSL TO OPTICAb/c FILTER ADAPTER: Use the F1 or F2 Adapter.

A VARIABLE IMAGE BRIGHTNESS SYSTEM: For observing the Moon and planets, it is often useful to reduce the image brightness. Using our Double Polarizer, or two singles in conjunction with a Clavé ocular, it is possible to vary the light transmission from 30% to 5%. To use these, use <u>either</u> one F-1 Adapter <u>and</u> one F2 Adapter, <u>or</u> two F2 Adapters may be used.

# FILTER SELECTION GUIDE

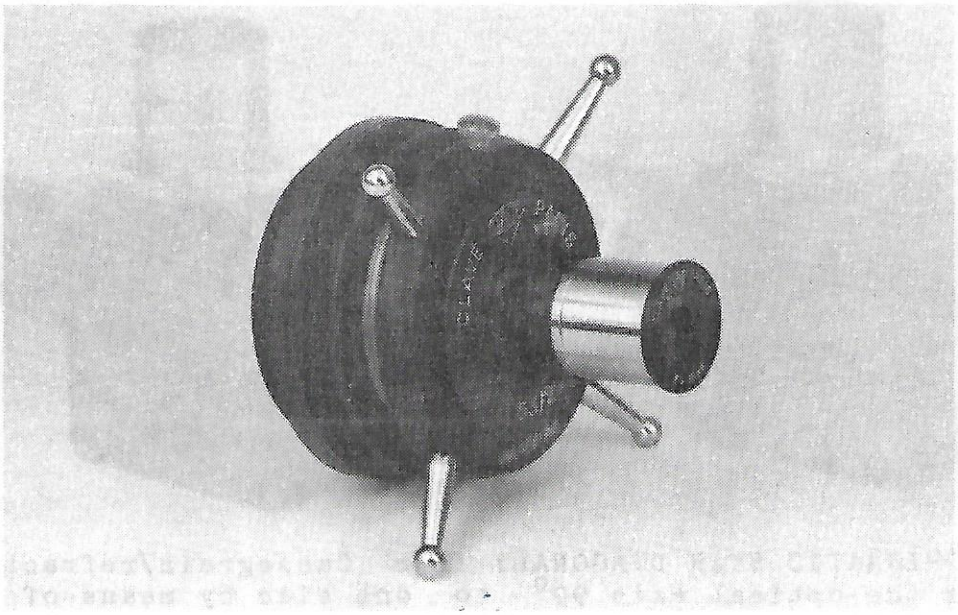
by Cross Optics

| APPLICATION | Dk Bl Violt 47B | Blu 38A 80A | Green 56 58/64 | GYlo Lt Y 8/11 | Yello 3N5 12/15 | Orng 21 | Lt Red 23A | Red 25A | Pol-ari-zer | C. N. D.* |
|---|---|---|---|---|---|---|---|---|---|---|
| MAXIMUM definition with refractors | | | | X | 12/15 | | | | | |
| MOST USEFUL for planetary colorimetry and photometry | X | | X | | 15 | | | X | | |
| MOST USEFUL for observing the planets with 3-6-inch telescopes | | X | X | | X | | X | | | |
| Low power planets | | | 58 | | 3N5 | | X | | 1-2 | X |
| Atmospheric markings on Venus | X | | | | | | | | | |
| Jupiter's Red Spot | X | 38A | 58/64 | | | | | | | |
| Jupiter's Bands and Festoons | | X | X | | | X | | | | |
| Dark markings on surface of Mercury/Mars | | | | | X | X | X | X | | |
| Atmospherics and Polar hoods on Mars | X | X | 58/64 | | | | | | | |
| Visual colorimetry and photometry of Saturn and its rings-8-inch or larger telescope | X | X | 58 | X | 15 | X | X | X | | |
| Low power viewing of the Moon between qtr and full | | | | | 3N5 15 | | | | 1-2 | X |
| MAXIMUM lunar detail | | | | X | X | | | | | |
| Polarization studies | | | | | | | | | X | |

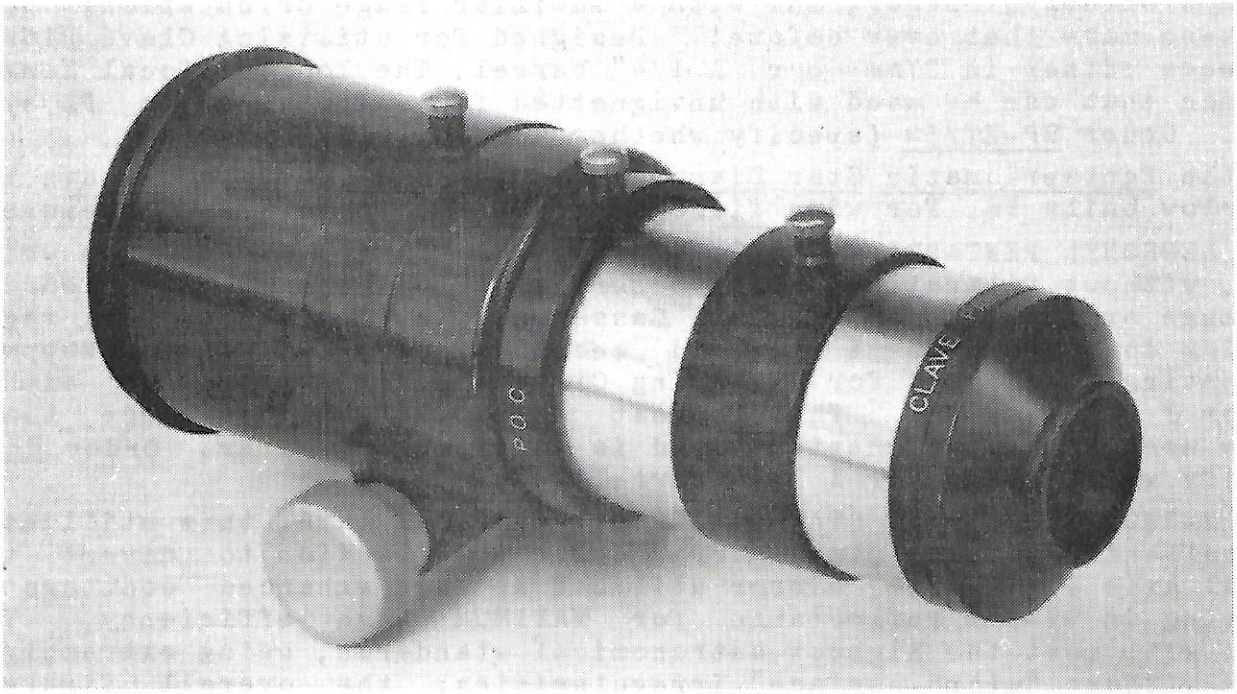
FOR ENHANCED CONTRAST AND DEFINITION of lunar and planetary detail, Cross TYPE-2 eyepiece/Barlow filters are guaranteed to be the finest threaded filters obtainable. The filters are made of plane-parallel optical glass dyed-in-the-mass to Wratten transmission specifications. The precision made black anodized filter mounts are threaded for insertion into the F1 or F2 Filter Adapters, or directly into the Super Barlow. The Wratten color/spectral designator is engraved on each filter to permit easy filter selection in dim starlight. The 1-inch clear aperture permits wide field observation of the Moon as well as direct photography of comets and starfields without any ocular at all.

*C.N.D.= Clavé Neutral Density filter. 10%, 20% or 50% may be used.

# CLAVÉ FOCUSSERS



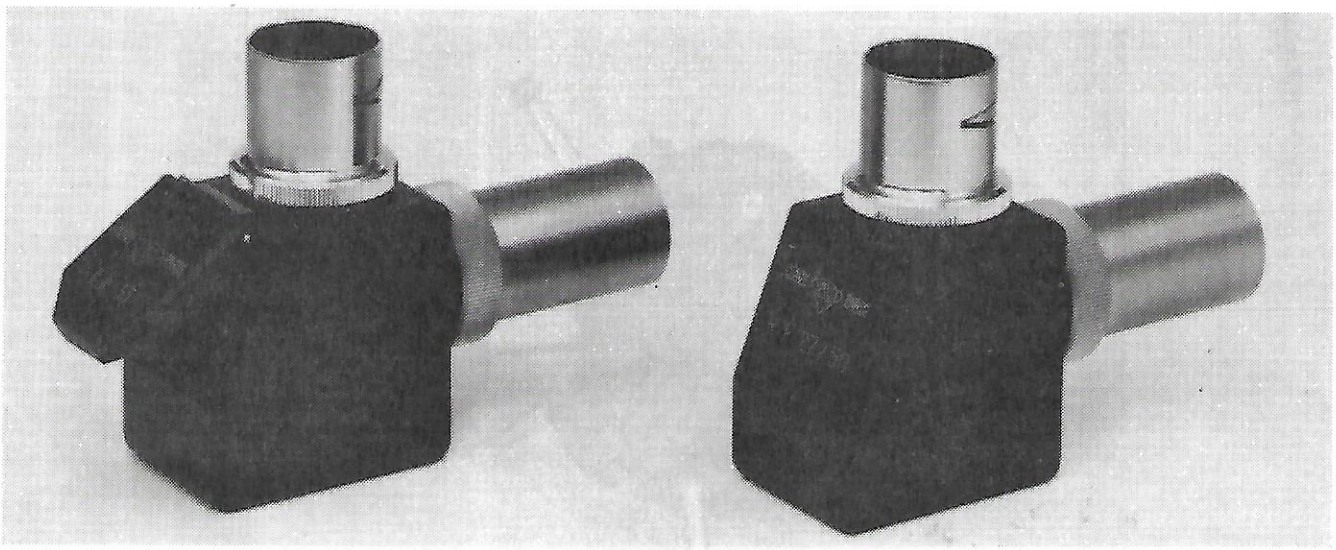
POV-HELICAL TYPE: Mounted collapsed height of 11.5mm, extends to 31.5mm. Allows largest possible field with minimum secondary mirror size. Especially designed for f/3 to f/8 systems. Specially made so that the eyepiece, camera, or accessory does not rotate. To be mounted on a flat plate of 11 to 22mm thickness having a mounting hole of 74mm diameter. Equipped for utilizing 1 1/4" and 50mm Clavé Plössl eyepieces. Weight approximately 500 grams. Order POV.




POC RACK AND PINION TYPE: Mounted collapsed height of 98mm, extends to 131mm. Set screws for fixing position of the rack tube and draw tube. Especially designed for f/8 to f/15 systems. A base plate with bolt holes is supplied for mounting on a flat plate.

Equipped for utilizing 1 1/4" and 50mm Clavé Plössl eyepieces. Weight approximately 600 grams. Order POC.

# CLAVÉ RIGHT-ANGLE VIEWERS



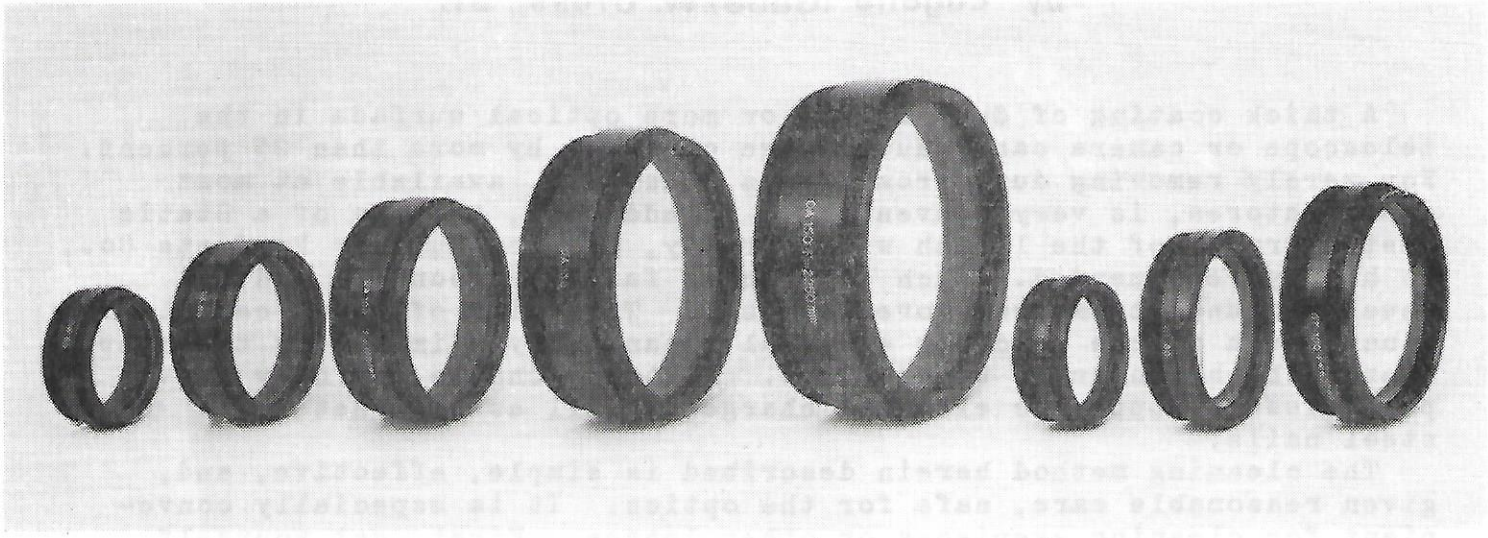
CLAVÉ PENTAPRISMATIC STAR DIAGONAL: For Cassegrain/refractor owners, this directs the optical axis 90° to one side by means of TWO total reflections within a pentaprism. Unlike other right angle devices, whether mirror or prism, which utilize one reflection and produce an "erect" but right-left reversed image, the Clavé Pentaprismatic Diagonal maintains the astronomer's accustomed normal inverted image orientation. The image appears just as it would without this device, except that now the eyepiece is in a convenient position for viewing with unstrained eye and neck muscles. And due to the state-of-the-art optical tolerances maintained in every aspect of making this device, there is no loss of definition when using it. The observer views more comfortably, longer, and with a familiar image orientation; he then sees more that ever before! Designed for utilizing Clavé Plössl eyepieces either in 27mm or 1 1/4" barrel. The longest focal length eyepiece that can be used with unvignetted field is the 25mm FL eyepiece. Order RP-27/50 (specify whether 27mm or 1 1/4" barrel).

Both the Pentaprismatic Star Diagonal and Herschel Pentaprism have the 2X Barlow built in. For wide field observation, Barlow can be removed.

CLAVÉ HERSCHEL PENTAPRISM: Allows observing the sun directly in white light, without filtration, while observing with the same convenience and image orientation as above. Cassegrainian telescopes will require stopping down off-axis to avoid secondary mirror and support overheating. Designed for utilizing Clavé Plössl eyepieces in either 27mm or 1 1/4" barrel. The longest focal length eyepiece that can be used with unvignetted field is the 25mm FL ocular. Order DH-53 (specify whether 27mm or 1 1/4" barrel).

LARGE 2-INCH REFLECTING STAR DIAGONAL: Made by Clavé, this utilizes an excellent optically plane mirror and one reflection to divert the optical axis 90°. The mirror utilizes special enhanced coatings resulting in 97-99% reflectance for MAXIMUM light efficiency. The mirror will meet the highest astronomical standards, being extremely smooth without "micro-surface" irregularities; the overall figure indicates a convexity or concavity from edge to edge of LESS than $\lambda/20$ of Sodium light. There is no detectable image degradation whatever. Unlike other 2-inch diagonals having small working apertures (many only 37mm), the Clavé 2-inch diagonal has a working aperture of 48mm, and will fully illuminate even the 65 and 75mm FL Clavé Plössl oculars. Designed for use only with the large 50mm C.D. eyepieces (30-75mm Plössls). Must be used with focussing mechanisms accepting standard 2.0-inch accessories. Order RC-50/2.

# OBJECTIVE LENSES



These are state-of-the-art achromatic (2 lens type) objective lenses, of the aplanatic type, air spaced elements for optimum chromatic correction, all air-to-glass surfaces are multi-coated with anti-reflection coatings, and supplied in precision machined metal mounts assuring perfect centering of optical and mechanical axes. These are guaranteed to better Dawes' limit in on-axis visual resolution. SUPERB! Price includes dew/sun shade cap. Other diameters and focal lengths quoted on request.

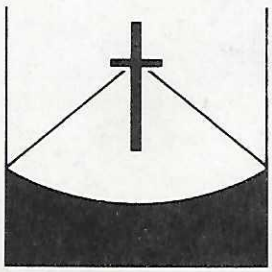
HIGH DEFINITION OBJECTIVE LENSES BY CLAVÉ

| CLEAR APERTURE | FOCAL LENGTH | FOCAL RATIO | NET WEIGHT | ORDER NO |
|---|---|---|---|---|
| 60mm | 720mm | f/12 | 310gr | OA-60 |
| 80mm | 1208mm | f/15 | 660gr | OA-80 |
| 100mm | 1526mm | f/15 | 1145gr | OA-100 |
| 130mm | 1908mm | f/15 | 2505gr | OA-130 |
| 150mm | 2250mm | f/15 | 3255gr | OA-150 |
| 200mm | 3006mm | f/15 | 8000gr | OA-200 |

"FAST" OBJECTIVE LENSES

| | | | | |
|---|---|---|---|---|
| 60mm | 300m | f/5 | 520gr | OT-60 |
| 80mm | 400m | f/5 | 588gr | OT-80 |
| 100mm | 600m | f/6 | 1170gr | OT-100 |

These fast achromatic (2 lens type) objective lenses are manufactured by Clavé and have cemented elements; both air-to-glass surfaces are multi-coated with anti-reflection coatings. These are designed for terrestrial observations but work well for low power astronomical viewing. All are supplied in precision mounts.



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