Astro - Physics
839 Brae Burn Lane
Rockford, Illinois 61107

ASTRO-PHYSICS now offers an expanded line of Precision APOCHROMAT Refractors, mountings, and accessories to the amateur community. Our telescope optics are based on the award winning Christen Triplet design, featuring very low residual aberrations and superb color correction in a short focal length design. The result is a highly portable refractor system with superior imaging qualities, ideal for a wide variety of astronomical work from high power lunar/planetary to deep sky astro-photography.

ASTRO-PHYSICS manufactures its telescopes in-house. Our optics are 100% AMERICAN MADE, and we use only precision "A" grade optical materials. All lenses are polished on pitch laps and hand corrected on a double pass interferometer. All of our objectives are APOCHROMATIC which means that the images are essentially free of false color, both visually and photographically.

Our telescopes were developed with the active observer in mind. We have concentrated on those things that make observing a joy: sharp high-resolution optics, rugged vibration free mountings and easy to use effective accessories. Our telescopes are not loaded with frills and doo-dads. The tube assemblies are finished in a durable weather resistant epoxy coating. We offer a unique, unobstructed, highly corrected optical system designed to give a lifetime of observing pleasure. When choosing a telescope, we encourage you to compare, side by side, our optical and mechanical qualities with scopes of similar size.

Our lenses use three matched optical glasses to combine the colors of the visual spectrum into intense, sharp, concentrated images. High transmission glass, free of striae and imperfection is used to make the objective lens. This results in a clean optical system with superior resolution, contrast and light gathering power. When seeing permits, powers up to 100X per inch of aperture are practical for lunar/planetary or double star work. The wide-field performance of this design is outstanding. Images on color film are crisp and sharp with no annoying blue halos around bright stars. Wide-field 2 inch oculars can be used for low power visual exploration of the sky. Deep sky objects stand out in stark contrast against velvet black skies.

LOW POWER WIDEFIELD REFRACTORS

Our F6 Triplets are perfect for wide field astrophotography and deep sky visual work. They also work surprisingly well for high power lunar, planetary and double star observing. The short tube and light weight make them a delight to use in the field. Color correction extends from C to g wavelengths and the design is free of spherical aberration and coma. The lenses are designed to cover the 35mm format to the extreme corners. Filters are not required with color films. Our Flat Field Telecompressor extends the performance of these instruments to f4 with sharp microscopic images over the entire 35mm format. The matched Barlow Amplifier converts these scopes to F12 for high power observing. The tube assemblies listed below come with the same professional quality custom focuser as supplied with our larger scopes.

SPECIFICATIONS FOR 4 INCH F6 TUBE ASSEMBLY:

Objective ..... magnesium fluoride coated 3 element apochromat 24"+-1 efl.
Light transmission ..... 96.5% over the visible spectrum
35mm Photographic field ..... 2.3x3.2 deg. @ F6, 3.4x4.8 deg. @ F4
Secondary spectrum ..... Less than +-0.008% from C to F
Light gathering power ..... 210 times unaided eye
Focuser type ..... Helical rack & pinion; 2.5" I.D.; 5" travel; 2", 1.25" adapter
Tube assembly ..... Aluminum, 5" dia x 21" long, 7 lb, white epoxy, baffled, 5" dewcap

SPECIFICATIONS FOR 5 INCH F6 TUBE ASSEMBLY:

Objective ..... magnesium fluoride coated 3 element, apochromat 30"+-1 efl.
Light transmission ..... 96.5% over the visible spectrum
35mm Photographic field ..... 1.8x2.6 deg. @ F6, 2.7x3.8 deg. @ F4
Secondary spectrum ..... Less than +-0.008% from C to F
Light gathering power ..... 330 times unaided eye
Focuser type ..... Helical rack & pinion; 2.5" I.D.; 5" travel; 2", 1.25" adapter
Tube assembly ..... Aluminum, 6" dia x 26" long, 12 lb, white epoxy, baffled, 7" dewcap

HIGH RESOLUTION MEDIUM FOCAL LENGTH REFRACTORS

These intermediate focal length telescopes are very portable, yet they perform like traditional long focus doublets. Color correction is better than found in achromat doublets, resulting in more light concentrated into the image and a subsequent fainter magnitude limit. These scopes will reach the extremes of low and high power with ease. Wide field color astrophotography is easy with our Triplet Flat Field Telecompressor. The giant custom focuser insures full frame coverage resulting in lovely color or black & white photographs. Contrast and resolution are outstanding in these hand crafted scopes, with performance equalling or exceeding much larger commercial production telescopes.

SPECIFICATIONS FOR 4 INCH F10 TUBE ASSEMBLY:

Objective ..... magnesium fluoride coated 3 element apochromat, 40"+-1 efl.
Light transmission ..... 96.5% over the visible spectrum
35mm Photographic field ..... 1.4x1.9 deg. @ F10, 2x2.9 deg. @ F6.7
Secondary spectrum ..... Less than +-0.008% from C to F
Light gathering power ..... 210 times unaided eye
Focuser type ..... Helical rack & pinion; 2.5" I.D.; 5" travel; 2", 1.25" adapter
Tube assembly ..... Aluminum, 5" dia x 37" long, 8 lb, white epoxy, baffled, 5" dewcap

SPECIFICATIONS FOR 5 INCH F8 TUBE ASSEMBLY:

Objective ..... magnesium fluoride coated 3 element apochromat, 40"+-1 efl.
Light transmission ..... 96.5% over the visible spectrum
35mm Photographic field ..... 1.4x1.9 deg. @ F8, 2x2.9 deg. @ F5.3
Secondary spectrum ..... Less than +-0.008% from C to F
Light gathering power ..... 330 times unaided eye
Focuser type ..... Helical rack & pinion; 2.5" I.D.; 5" travel; 2", 1.25" adapter
Tube assembly ..... Aluminum, 6" dia x 37" long, 13 lb, white epoxy, baffled, 7" dewcap

SPECIFICATIONS FOR 6 INCH F8 TUBE ASSEMBLY:

Objective ..... magnesium fluoride coated 3 element apochromat, 48"+-1 efl.
Light transmission ..... 96.5% over the visible spectrum
35mm Photographic field ..... 1.1x1.6 deg @ F8, 1.7x2.4 deg @ F5.3
Secondary spectrum ..... Less than +-0.008% from C to F
Light gathering power ..... 460 times unaided eye
Focuser type ..... Helical rack & pinion; 2.5" I.D.; 5" travel; 2", 1.25" adapter
Tube assembly ..... Aluminum, 7" dia x 45" long, 19 lb, white epoxy, baffled, 9" dewcap

SUPER PLANETARY REFRACTORS

The f12 objectives are designed to deliver the highest possible contrast for the most discriminating lunar/planetary observer. Color correction is essentially perfect, far exceeding that obtained in even the finest achromatic doublets. Planetary contrast is crisp and sharp and the bright limb of the moon butts against black sky showing the sharp profiles of mountains and craters. As one veteran observor wrote us about his 5" f12 : "Contrast and brilliance of the image is quite astonishing. The lunar surface reveals a spectacular wealth of detail. But most important is the lack of fuzzing at high power. Even at 650x (130 power per inch!) the image holds up amazingly well." Low power performance of these long focal length lenses is equally impressive. Giant wide field oculars will show star fields and deep sky objects with high contrast just like our faster lenses do. Astrophotography is possible at f8 with the Triplet Telecompressor. The Barlow may be used for photo-visual work at f24, and even longer focal ratios are possible with the eyepiece projection adapter.

SPECIFICATIONS FOR 5 INCH F12 TUBE ASSEMBLY:

Objective ..... magnesium fluoride coated 3 element apochromat, 60"+-1 efl.
Light transmission ..... 96.5% over the visible spectrum
35mm Photographic field ..... 0.9x1.3 deg. @ F12, 1.3x2 deg. @ F8
Secondary spectrum ..... Less than +-0.004% from C to F
Light gathering power ..... 330 times unaided eye
Focuser type ..... Helical rack & pinion; 2.5" I.D.; 5" travel; 2", 1.25" adapter
Tube assembly ..... Aluminum, 6" dia x 57" long, 14 lb, white epoxy, baffled, 7" dewcap

SPECIFICATIONS FOR 6 INCH F12 TUBE ASSEMBLY:

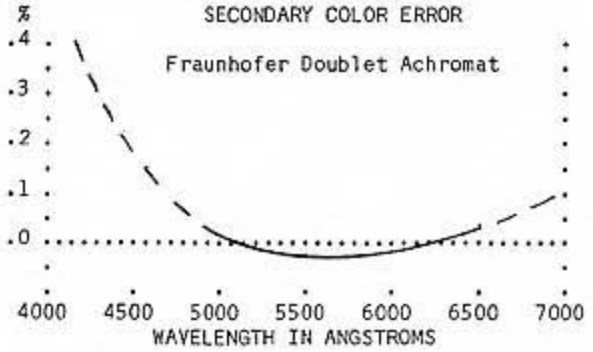
Objective ..... magnesium fluoride coated 3 element apochromat, 72"+-1 efl.
Light transmission ..... 96.5% over the visible spectrum
35mm Photographic field ..... .75x1.1 deg @ F12, 1.1x1.6 deg @ F8
Secondary spectrum ..... Less than +-0.004% from C to F
Light gathering power ..... 460 times unaided eye
Focuser type ..... Helical rack & pinion; 2.5" I.D.; 5" travel; 2", 1.25" adapter
Tube assembly ..... Aluminum, 7" dia x 69" long, 21 lb, white epoxy, baffled, 9" dewcap

COLOR CORRECTION CURVES OF ASTRO-PHYSICS LENSES

These charts compare the color correction of the Astro-Physics lenses with achromats and fluorides. The amount of color seen visually increases directly with lens diameter and decreases with longer focal ratios. Generally for lenses longer than f8 in the 4 to 8 inch aperture range, the color error is not noticeable if it's less than .05% of the focal length. While color correction is the largest aberration, some lens designs have inherent higher order aberrations such as sphero-chromatism and zonal spherical aberration. These aberrations can also affect the sharpness and contrast of a lens. Lenses with sphero-chromatism are undercorrected for spherical aberration in the red waves, and show overcorrection in the blue and violet waves. Zonal spherical is usually a combination of 3rd and fifth order aberrations. These high order aberrations may show up as zones and turned edge, and in some cases they can be brought under control only with much difficulty, even by a skilled optician .

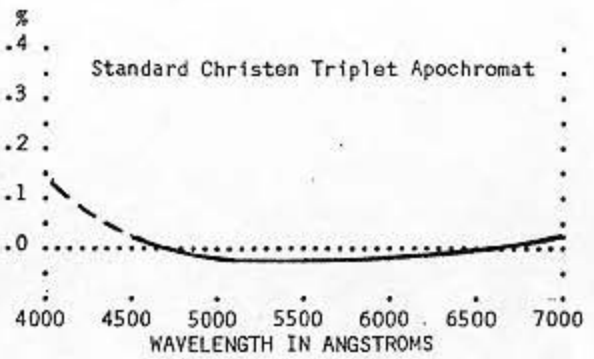
The following charts show the color error over the principal wavelength range, and highlights the useful visual spectral range of each lens.

The standard doublet achromat has undergone little change since its invention. Secondary color error is about the same regardless of the combination of crowns and flints used. Higher order aberrations are usually very well corrected in the longer focal ratios. In small apertures and long focal ratios, the achromat shows little color, and is capable of good definition and contrast.

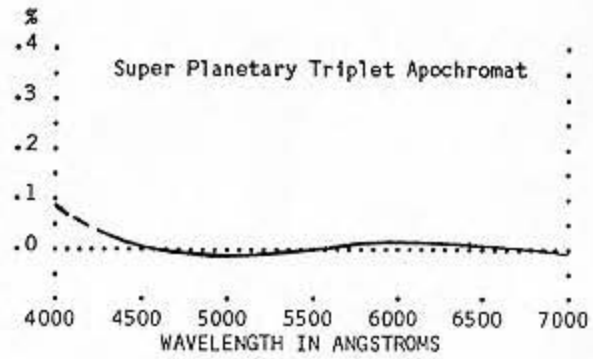


The reduction or elimination of secondary color requires an abnormal dispersion glass as one element in the optical system. The first practical apochromat was designed and built by Dennis Taylor over a century ago. His combination of Boron Flint glass and two normal glasses resulted in an f18 airspaced lens that had "sensibly perfect" color correction. These first triplets could only be made in long focal ratios because the glass was not very abnormal, and the elements required steep curves on the inner faces.

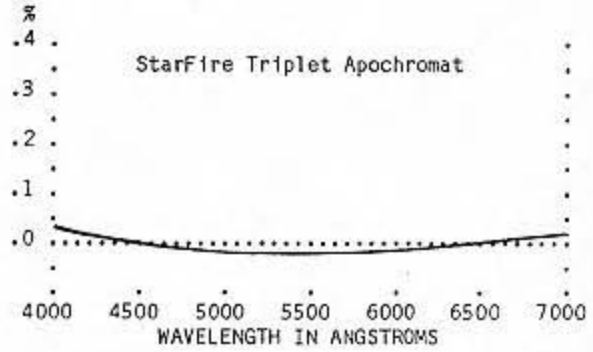
The Christen Apochromat uses a modern Boron Flint glass with two normal dispersion glasses. The newer glasses allow for a a much faster lens than the original Taylor triplet. At F8 the Christen Triplet shows a brighter, more contrasty image than a normal achromat. Zonal spherical, sphero-chromatism and lateral color errors are well under control. The violet color error is noticeable on film, but can be eliminated with a minus violet filter.



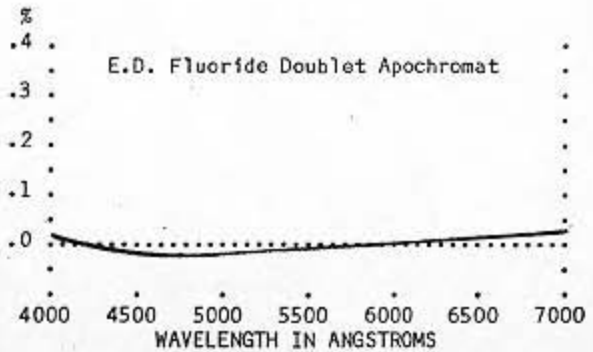
This design meets the highest requirement for definition and contrast in a planetary lens. In a 6" F12 version, secondary color essentially vanishes in the visual spectrum, and the higher order zonal aberrations are insignificant from C to F (6563 to 4861 A). The design is a classic apochromat with three zero crossings where three colors come to the same focus. The lens is also free of coma, and can cover its own diameter when used with a suitable field flattener.



By using two abnormal dispersion glasses, the violet color can be substantially reduced. The StarFire design has all the characteristics of an E.D. lens without the use of any Fluoride glass. Star images show intense white Airy discs. The Moon and Planets show no false colors at any power. The design can be made as fast as F8 - F9 which makes them ideal for astro-photography. The low cost of these lenses cannot be matched in a Fluoride design.



The first fluoride apochromat lens was designed by Ernst Abbe a century ago. Since then this apochromat system has been rediscovered numerous times. Recently, Mike Simmons came up with the first well designed doublet using Calcium Fluoride as the E.D. element. This material is too expensive for practical lenses, but the new Fluoro-Phosphate glasses are less costly and offer the same performance. E.D. lenses are usually designed with the flint leading to protect the very soft fluoride element. Two element lenses of this type show substantial sphero-chromatism and zonal aberration because there are not enough degrees of freedom with only two glasses. In more advanced designs, the airgap is used as a third element through proper bending of the airgap, spacing of the elements and aspherization of one of the surfaces. This type of Fluoride lens can have superb planetary performance in focal ratios as short as F8, but it is quite expensive to produce.



Astro - Physics

7"F9 on
Model 706
Equatorial

The Christen STARFIRE is a fantastic new Refractor that delivers the uncompromising performance of the classic long focus instrument in a very compact and portable package. This telescope was designed on a challenge to deliver the absolute highest possible image quality for lunar/planetary observing while still remaining a truly portable instument. The result is not only a fine planetary telescope, but also a superb deep sky instrument with unlimited photographic possibilities. The heart of this system is a new Triplet lens design that virtually eliminates secondary color and higher order aberrations over the immense spectral range of 400nm to 700nm (from the edge of the U.V to the infrared region). The lens design incorporates two special dispersion glasses that are matched to the hard crown front element. The result is Fluoride - like performance without the thermal limitations and high cost of Fluoride. The image quality, contrast and color correction is so good that it is hard to believe one is looking through a short focus refractor. Two models of the **STARFIRE** are now available:

142mm. (5.6inch) F7 Widefield Refractor
178mm. (7.0inch) f9 Planetary Refractor

The smaller instrument's size is comparable to that of a modern 4 inch refractor, but with it's 142mm (5.6 inch) aperture the light grasp is more than twice that of the 4 inch scope. In sheer resolution and image quality even the popular 8"-10" catadioptrics will have a hard time equalling this refractor. The 178mm telescope is a truly magnificent instrument. Its resolving power and light grasp put it in a class all its own. The 1600mm. (63 inch) focal length allows a wide range of powers (29x, 2deg. field with 55mm Pl. to 700x with 4mm and 1.8x barlow). Both telescopes can be used photographically without filters.

FEATURES:

- High resolution APOCHROMAT Optics
- Fully baffled tube with custom finish
- Custom helical rack & pinion focuser
- Dust cover and Dewcap

STARFIRE 142mm F7 APOCHROMAT Tube Assembly, 38"length, 6"dia, 19 lb 1850.00
STARFIRE 178mm F9 APOCHROMAT Tube Assembly, 61"length, 7"dia, 34 lb 3600.00

OPTIONAL ACCESSORIES:

- 8x50 crosshair Finderscope
- High quality 2 inch mirror diagonal
- Rugged foam lined carrying case
- Flat Field Telecompressor for 35mm photography
- Camera adapter for prime focus, 35mm format
- Photo-visual 2x Barlow Amplifier
- Eyepiece Projection System
- 3 Inch Photo-Guidescope with rings
- Matching Astrographic German Equatorial Mountings

For more information on these and other products, write or call:

ASTRO-PHYSICS
839 BraeBurn Ln
Rockford, IL. 61107
Tel: 815-226-1471

Reviews

6-inch f/8 Apochromatic Refractor
Model 706 German equatorial mount
optical tube assembly, $1295
equatorial mount, $1995
Astro-Physics Corp.
Rockford, IL

Every decade or so, there is an innovation in telescope technology that alters the whole field. The Schmidt-Cassegrain telescope, two decades ago, was one such invention; the Dobsonian mounting was another. The latest such development is the perfection of the apochromatic refractor by Roland Christen, head of a small company named Astro-Physics. Although refractors have long been held in high regard, Christen's new line of color-free apochromatic systems provide unparalleled performance at a price competitive with conventional achromatic refractors.

Conventional two-element lenses, and many three-, four-, and five-element lens systems, fail to satisfactorily reduce chromatic aberration in refractors. The remaining color aberration, or "secondary spectrum," places severe limits on the shortest focal ratio capable of producing well-corrected images for a given aperture. For a conventional doublet with a 3-inch aperture, the focal ratio must be f/8 or greater; for a 4-inch, f/10; and for a 6-inch, f/15. Although they perform reasonably well despite their shorter focal ratios, achromatic refractors suffer from color error.

Enter the apochromatic refractor. By designing a refractor lens using three glasses (one having "abnormal" optical properties), it is possible to significantly improve on the two-element lens. This does not mean "the more elements the better" — the glass used must be the right type. Roland Christen, who has spent some 10 years designing apochromatic refractors, has now brought these exceptionally fine and versatile lenses within the reach of amateurs on an average budget.

I had a 6-inch f/8 Astro-Physics apochromatic refractor and model 706 German equatorial head and pier on loan for three weeks. During that time, I managed to put it through its paces quite thoroughly. For an instrument of this aperture and such short focal length, the performance was little short of stunning.

The telescope arrived in a large box, complete with dew cap, mounting rings, a massive focuser unit, and 1.25- and 2-inch eyepiece adaptors. Construction quality was excellent — the solidly-made 2.5-inch focuser being the latest refinement in a steadily evolving design. Finished in white, the instrument had a spare, almost utilitarian, look about it but its performance was extravagant. At less than 20 pounds and a bit over 4 feet long, it was hard to believe this compact unit was a 6-inch refractor. Doublets of this aperture typically require eight-foot tubes.

The Model 706 mounting and pier were equally solid. The turnbuckle and rod-braced pier is, for all its simplicity, exceedingly rigid, supporting the equatorial head better than just about any other design I've seen. The pier weighs 40 pounds and the mount weighs another 50 pounds, including counterweights.

The equatorial head is machined from heavy aluminum castings. It worked very well: the slow motions were smooth and backlash-free, and the drive tracked well even at high magnification. It did not disappoint us once during testing. However, I would like to see a better way of setting the equatorial's latitude. In the unit evaluated, adjusting the polar angle required using a box-end wrench and "fussing" until the polar angle was set within a fraction of a degree. Once set, though, it stayed in adjustment. The total setup time, including polar alignment, was about 15 minutes.

As noted above, the optical performance of the Christen 6-inch f/8 apochromatic objective is little short of stunning. The objective is available in two different "color corrections" — visual and photographic — and in two different focal ratios — f/8 and f/12. Each color correction is optimized for its purpose; the visual correction is fine-tuned to give the best images in the yellow-green light our eyes are most sensitive to, while the photographic version is best in blue light. As with achromats, apochromats perform their best at longer focal ratios. The f/8 version is intended for all-around use, while the f/12 version is made for those who demand the very best color correction available. Although the lens evaluated was the photographic version of the f/8 lens and theoretically the "worst" of the four possibilities, it still delivered outstanding performance.

I carefully compared the Christen 6-inch f/8 apochromat to a high-quality 6-inch f/15 achromatic refractor, an 8-inch SCT, and a 10-inch Newtonian with an excellent mirror. Of the four instruments, only the 10-inch Newtonian, which had 60% greater aperture and nearly triple the collecting area, compared favorably in resolving power and overall image brilliance. There was no contest with the 8-inch SCT — *both* of the refractors beat it hands down.

The most telling comparison came between the two refractors. Six-inch f/15 achromatic refractors have long been a standard of quality that few amateur instruments can match. A 6-inch f/15 doublet is, however, handicapped by significant secondary spectrum. Around a bright star image, the observer sees a halo of purplish light nearly one minute of arc across. The saving grace of doublet refractors is that they form a crisp, contrasty star image in yellow-green light.

The 6-inch f/8 Christen photo-apochromat, while not perfect, displayed considerably less secondary spectrum than the f/15 doublet. This version of the lens, which has minimum focus in the blue, still combines the violet, green, yellow, and orange quite well. Red light, however, focuses farther from the lens, forming a slight crimson halo around bright objects. Epsilon Lyrae, for example, was cleanly split, but each star was surrounded by a faint ruddy halo of light.

Saturn — crisp, clearly defined, and showing Cassini's Division in sharp contrast — was also subtly red-rimmed. It bears re-emphasis, however, that the f/8 photo-triplet's images were considerably better than those of a high-quality 6-inch f/15 visually-corrected refractor.

A month after I returned the apochromat to Astro-Physics, I saw one of the 6-inch f/8 visually-corrected triplets at Stellafane. The visual version of the lens is virtually color-free with no trace of the red halo characteristic of the photographic version. Unless astrophotography were a determining factor, I would certainly prefer the visual version of the f/8 instrument; better yet, I would get the f/12 version, in which chromatic aberration would be almost non-existent.

One interesting side effect of the Christen triplet's superb image quality is that the faintest stars visible are roughly half a magnitude fainter than for doublet refractors or reflectors of the same aperture. The reason for this, presumably, is that all the light entering the triplet telescope ends up concentrated in the image, whereas in the doublet, considerable light is spread into the purplish halo surrounding a yellowish image core. Reflectors suffer from lower "throughput" due to the 88% reflectivity of aluminized and overcoated mirrors, the obstruction of the secondary, and the larger diffraction pattern caused by the obstruction. The same probably holds true of SCTs, but I did not have a 6-inch SCT on hand for direct comparison.

The Astro-Physics 6-inch f/8 refractor with its Christen triplet lens sets a new standard for optical quality in telescopes on the amateur market at a quality/price ratio that's hard to beat. With relatively minor cosmetic improvements and redesign of the latitude adjustment for the equatorial head — neither of which posed any real problem and which are now in the works, according to Christen — the model 706 equatorial mount will be tops in all categories. I recommend the visually-corrected lens unless astrophotography is an all-consuming passion, or the f/12 lens if you want the ultimate in planetary images. I found the f/8 focal ratio an excellent all-around compromise, suitable for low-power observing as well as high-power splitting of double stars and observing planetary detail. If I didn't already have a house full of telescopes, I would have placed my order for one. *Richard Berry.*

4-inch f/6 Apochromatic Refractor
Optical tube assembly, $795
Astro-Physics Corp.
Rockford, IL

Very rarely does a new product immediately impress me as truly outstanding, but the recently-introduced line of apochromatic refractors from Astro-Physics has succeeded in doing so. I had nearly a month to put their 4-inch f/6 apochromatic refractor instrument through its paces, not only by testing it on close double stars and planets, but also by testing it against a precision optical test flat using the Foucault and Ronchi tests. Overall, the lens rates as one of the finest — if not *the* finest — commercial objectives I have had the opportunity to test. The telescope is an outstandingly versatile instrument for the beginner or advanced amateur.

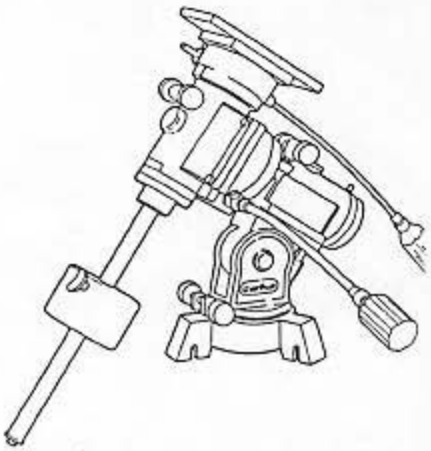
The telescope that I evaluated (unfortunately, Astro-Physics apparently does not put serial numbers on its telescopes) was optimized for photographic work, so the objective had its shortest focus in blue light. Although visually corrected lenses usually have their shortest focus in the yellow-green part of the spectrum, the instrument had sufficiently good color correction for critical work at high magnification.

Using a 4mm eyepiece, the apochromat provided a superb view of Saturn. It split the unequal double star Epsilon Bootis as cleanly as I have ever seen it split with any 4-inch telescope, and better than I have seen many 6-inchers manage. Epsilon Lyrae was so perfectly and clearly split that it looked like two tiny pairs of diamonds resting on black velvet. With a 9mm Nagler eyepiece, the view was stunning. Stars were rendered absolutely crisp and sharp to the extreme edge of the field, making the rich starfields in Cygnus impressive even from my rather badly light-polluted backyard. With a 32mm Erfle, the instrument could act as its own finder or as an RFT for sweeping the Milky Way. Few instruments offer such low to high power versatility, and no other I have seen even comes close to the Astro-Physics apochromat in combined versatility and optical quality.

I star-tested the apochromat on the Astro-Physics model 706 equatorial mount. This mount is intended for larger instruments in the Astro-Physics line, so it was great for the compact 10-pound 4-incher. The pleasure of testing a fine optical system was doubled by the ease of using this rock-solid equatorial mount. The out-of-focus star image was very nearly the same inside and outside focus, testifying to excellent centering and overall correction of the lens. However, testing on a bright star (Vega) just inside focus, the image had a slight reddish halo; outside focus it had a pale greenish fringe. The color fringes disappeared at the best focus. These rather subtle effects just inside and outside focus were the only visible remnants of chromatic aberration which destroys fine definition in a conventional 4-inch f/6 achromat.

After critical star-testing, I tested the apochromat against a high-precision optical flat (i.e., in autocollimation) in blue, green, and red light using both the Foucault and Ronchi test. These tests revealed weak spherochromatism, accounting for the color fringes seen in the star test. Although hardly enough to harm the image, the objective appeared slightly undercorrected in red light; in blue light it was slightly overcorrected. In green, the Ronchi bands were straight, indicating no residual spherical aberration. The Foucault test in autocollimation revealed some faint zones in the figure of the lens, but it was free of significant optical defects. Very few commercial optical systems stand up this well to critical examination.

In sum, the 4-inch f/6 apochromatic refractor from Astro-Physics is an outstanding value, providing unparalleled optics in a fine mechanical assembly at a price below that of its competition. As a versatile first telescope or as an advanced amateur's go-anywhere telescope, the Astro-Physics 4-inch f/6 apochromat is unsurpassed. *Richard Berry.*



"SUPER NOVA" MOUNT

We are importing this light weight portable mount as an alternate for our small and medium sized scopes. The equatorial head is equipped with setting circles, fine slow motion controls on flexible shafts, worm gears in both declination and polar axes, 6.4 lb. counterweight. The mount is easily disassembled. The polar axis is hollow for an optional polar scope. An optional pulse motor drive is available for tracking the stars. Azimuth and latitude adjustments are standard. This solid and stable mount will easily hold all our 4 and 5 inch scopes, as well as the 5.6" StarFire and the 6" F8 tube assemblies. With our solid oak tripod, the stability of this mounting exceeds that of any of the popular imported versions. Equatorial weight is 24 lb.

Super Nova Equatorial Head, as pictured above with one 6.4 lb. weight..... 495.00

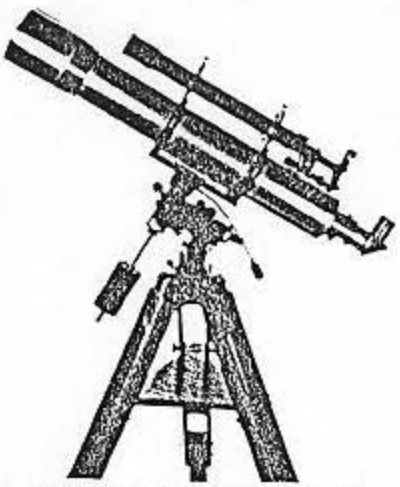
Extra Balance Weight, 6.4 lb..... 35.00
3.3 lb. 25.00

Multi-plate..... 85.00
This plate is necessary to support the hex rings for the 5" and 5.6" and 6" scopes. It is also used to expand the versatility of the 4" scopes by providing a plate to mount guidescopes and cameras for astrophotograpy.

Hexagonal Mounting Rings, choose the appropriate size:
5.0" (127mm) for Astro-Physics 4" scopes, per pair 38.00
6.0" (153mm) for Astro-Physics 5" and 5.6" scopes, per pair..... 46.00
7.0" (178mm) for Astro-Physics 6" scopes, per pair 48.00

Polar Axis Scope 95.00
This accessory fits into the polar axis and makes polar alignment a snap. The illuminated reticle features a unique star field overlay for quick alignment.

Pulse Motor with Push Buttons and Battery Pack 220.00
Following the motions of the stars is easy with the Pulse Motor drive. This portable accessory operates off its own battery pack with buttons for reversing, stopping and 4x speed increase.



5.6"F7, mount, oak tripod, with 60mm guidesope

Solid Oak Tripod Legs for "Super Nova" Mount..... 425.00
This custom tripod is a smaller version of the oak tripod available for our own equatorial mounts. Its beauty and stability are unparalleled. The height of the legs is not adjustable which assures a more solid base of support. The sturdy shelf provides more stiffmess and keeps your accessories close at hand.

Adjustable Aluminum Tripod. 220.00
This light duty tripod is fully adjustable and collapses for easy portability. While not recommended for serious astrophotography for extended high power viewing, this tripod is an excellent choice for wide field low power sweeping.

Recommended Combinations. For your convenience, we have recommended some basic combinations of the above items for each scope:
4" f6, Super Nova mount, aluminum tripod, 5" hex rings 1648.00
4"f10, Super Nova mount, aluminum tripod, 5" hex rings, extra 3.3 lb weight 1673.00
5" f6, Super Nova mount, multi-plate, aluminum tripod, 6" hex rings, extra 3.3 lb weight 2066.00
5" f8, Super Nova mount, multi-plate, oak tripod, 6" hex rings, extra 6.4 lb weight 2281.00
5" f12, Super Nova mount, multi-plate, oak tripod, 6" hex rings, extra 6.4 lb and 3.3 lb. weights 2336.00
5.6"f7, Super Nova mount, multi-plate, oak tripod, 6" hex rings, two extra 6.4 lb weights 2971.00
6" f8, Super Nova mount, multi-plate, oak tripod, 7" hex rings, two extra 6.4 lb weights 2563.00

Camera Piggyback Mount with 2 axis micro-adjustment for easy framing of star fields 49.00

60 mm Guide Scope, 700mm fl. with .965 rack&pinion 150.00
Diagonal Prism, .965 ..... 35.00
9mm Guiding Eyepiece, .965, with illuminator, circular reticle 120.00
Guide Scope Micro Adjust Mount, adjusts 12 deg in RA and Dec for locating guide star..... 120.00
Guidescope Rings, 3.9" inside diameter with thumb screws, per pair..... 51.00

9x63 Deep Sky Binoculars 195.00
Roof prism type with fully illuminated exit pupil and sharp 6 deg. field, these superb binoculars are brighter than ordinary porro prism types. Perfect for finding dim objects or just zooming around the night sky.

ALT-AZIMUTH MOUNT

A silky smooth mounting for comet hunting, low power sweeping or terrestial observing. Teamed up with the aluminum tripod, it makes a very portable mounting for scopes up to 5 inches. Both axes have continuous worm gear drives with flexible cables and locking clutches.

HEXAGONAL MOUNTING RINGS

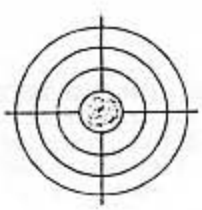
Choose the appropriate size:
5.0" (127mm) for Astro-Physics 4" scopes
6.0" (153mm) for Astro-Physics 5" scopes

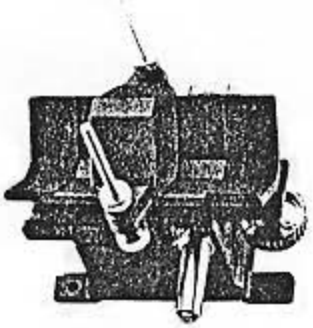
ADJUSTABLE ALUMINUM TRIPOD

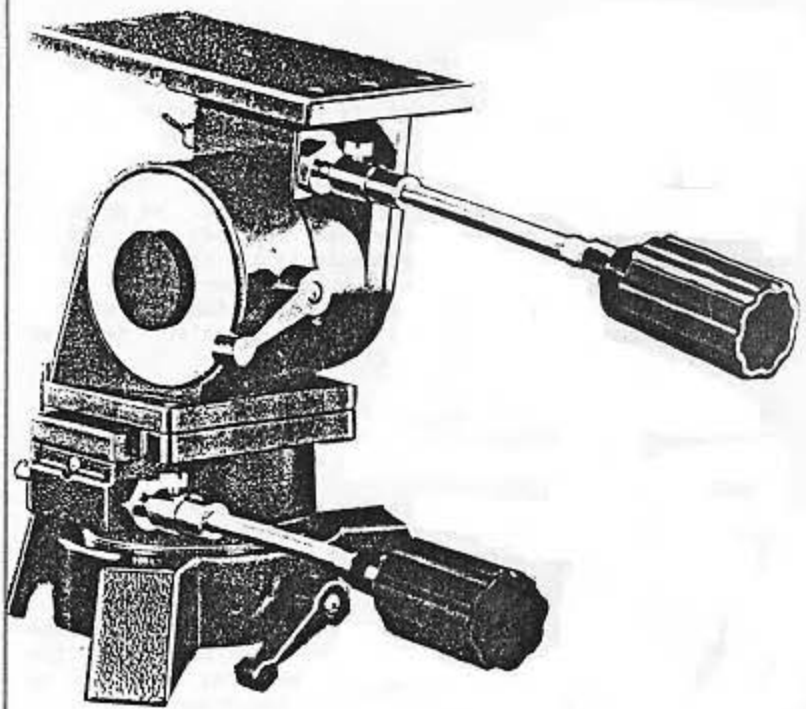
This light duty tripod is fully adjustable and collapses for easy portability. It is surprisingly sturdy and is an excellent choice for low and high power visual observing and occasional astrophotography.

SOLID OAK TRIPOD LEGS FOR ALT-AZIMUTH MOUNT

This custom tripod is a smaller version of the oak tripod available for our own equatorial mounts. Its beauty and stability are unparalleled. The height of the legs is not adjustable to assure a more solid base of support. The sturdy shelf provides more stiffness and keeps your accessories close at hand.







60 mm x 700 mm GUIDESCOPE

This light weight, powerful telescope is ideal for guiding because its low weight insures freedom from differential flexure. This guidescope uses .965" accessories. Various options are available for this guidescope:

DIAGONAL PRISM, .965

3x BARLOW Increases the power to 233x.

9mm GUIDING EYEPIECE

The reticle features four concentric circles with cross hairs to help you keep your guide star in the center of your field. This .965" eyepiece comes with the same kind of dark field illuminator as described for the polar axis scope. Specifications:

9mmOR (Diopter adjustable)
Apparent Field - 44 degrees

FINE-MOUNT FOR GUIDE SCOPE

This fine adjust mount is an alternative to traditional guidescope rings. It must be mounted on a flat plate, such as the multi-plate if you have a 4" telescope. The orientation can be altered by thumbscrew adjustment with a range of 12 degrees right-left and up-down for locating a guide star. Specifications:

Suitable for guidescopes from 40mm - 80mm diameter
Weight - 4.2 lbs (9.2kg)
Accessory - four M5 x 12mm bolts
one M5 4mm Allen wrench

GUIDESCOPE RINGS

These two rings have a 3.9" inside diameter and three thumb screws.

PHOTO-VISUAL BARLOW AMPLIFIER

This custom made accessory doubles the focal length of the objective for high power photo-visual observation. The 2 element design uses special glasses to preserve the fine color correction of the main objective. The optical elements are hand corrected and precision centered to insure that no aberrations are introduced into the system. The large optics will accept both 1.25 and 2 inch oculars and will cover a 2 inch photographic field with pinpoint images to the edge.

FLAT FIELD TRIPLET TELECOMPRESSOR

Three elements of special optical glass are used to match the characteristics of our triplet objectives in this flat field design. The result is a telecompressor with diffraction limited performance and no vignetting over the 35mm format. The field is absolutely flat with no coma, astigmatism or distortion. Deep sky objects are recorded in a fraction of the time needed at prime focus. This well corrected accessory lens preserves the high contrast and superb color correction of the main objective. A must for the serious astrophotographer.

ASTROGRAPHIC GERMAN EQUATORIAL MOUNTINGS

A good mounting is equally as important as the optics in a telescope system. Our mountings feature large thrust surfaces to transfer the telescope's mass to the tripod, thereby achieving maximum rigidity at minimum weight. Designed for astrophotography and high power visual work, this mount is steady even in gusting winds. Stainless ball bearings are used throughout, and solid stainless shafts guide the R.A. and Dec. axes. The declination axis features a precision tangent arm slow motion adjustment. The R.A. axis is driven by a synchronous motor and BRONZE worm for smooth tracking. Both axes respond to fingertip pressure with no hint of backlash. Built in clutches can be disengaged for ultra smooth sweeping, or locked for astrophotography. The entire mount disassembles quickly for easy transport and storage. An optional electric declination drive is available for hands-off guiding in Dec. The D.C. motor can be driven from most dual axis drive correctors providing 9 to 12 volts output. Optional setting circles are now available for model 706 mount.

SPECIFICATIONS FOR MODEL 504 AND 706 MOUNTS:

Polar axis ..... model 504 - 4" dia. thrust bearing, model 706 - 6" dia. thrust bearing
Dec. axis ..... 4" dia. thrust bearing - both models
Drive gear ..... Precision BRONZE ,+-.0002" backlash, model 504 - 4" dia., model 706 - 6" dia.
Motor type ..... 120 Vac. 60 Hz. 3 Watts, 230 Vac. 50 Hz. also available
Approximate weight (less counterweight) ..... 22 lb.- model 504, 29 lb.- model 706

SOLID OAK TRIPOD

This handsome tripod is built for ASTRO-PHYSICS by American craftsmen from solid oak. The hand made legs feature laminated bracing for high stiffness and strength. The tripod is finished with a beautiful protective lacquer. A sturdy shelf provides more stiffness, and will hold all your observing accessories. The shelf removes easily with large hand knobs and the entire tripod collapses for transport and storage. Tripod height is 56 inches at the base of the equatorial. Dimension when folded is 11"x 61". Weight is 37 lb. for the tripod, 5 lb. for the shelf.

PORTABLE PIER

This pier mounting features a unique tension design that combines rugged construction with light weight while eliminating flecture and annoying vibrations. Legs attach without hardware, allowing field assembly in seconds. Tension rods are designed not to interfere when the telescope is pointed at the zenith. Two sizes are available: the 46" pier with a resulting cradle height of 58", and a 60" model with a cradle height of 72" for long refractors. Both our models 504 and 706 will fit these piers. The 46" pier weighs 38 lb., and the 60" weighs 42 lb.

ACCESSORIES

ASTRO-PHYSICS can provide a wide range of domestic and imported accessories such as guiding equipment, finderscopes, oculars and diagonals at competitive prices.

COLOR CORRECTION OPTIONS

Our standard series of medium and short focal length refractors are color corrected for the visual range from C to F (Red to Blue). This correction works well for the vast majority of visual and photographic uses. Other corrections can be ordered for certain applications (such as for specialized black & white photography) where the far violet spectrum must be in focus at the expense of the red. Our Super Planetary Refractors and the StarFire series are well corrected for all colors from deep red to the far violet and therefore do not need to be ordered any other way.

NOTICE: All our lenses are coated with magnesium fluoride. This coating requires special care in cleaning. The coating can be easily damaged and is very costly to replace. We cannot provide any kind of guarantee for the coatings. If your lens is subject to frequent cleaning due to excessive dust or dewing conditions, you may wish to order your lens without the front coating. The loss of light will be 2.5%. No other degradation of image resolution or contrast will result. The hard crown front elements in all our lenses are not subject to damage with ordinary cleaning procedures.

NEW ... NEW ... NEW ... NEW ... NEW ... NEW ... NEW ... NEW ... NEW ... NEW ... NEW ... NEW ... NEW ...

SETTING CIRCLES

Our new setting circles are available as an option for our 706 mount. Customers awaiting delivery of their 706 mounts can add the circles to their order. Current owners can purchase the retrofit kit which includes the circles, mounting hardware and instructions. You can mount your long awaited circles within minutes. It's very easy.
The R.A. circle has 15 min. graduations
The declination circle has 1 degree graduations
The circles are black with white numbers and lines $100.00

CARRYING CASES

Attractive, durable cases are now available to protect and transport your Astro-Physics tube assembly. These cases were made to our specifications to be light weight, yet sturdy. They are constructed of wood with an attractive deep blue vinyl covering. Your tube assembly will be cushioned on the sides and bottom with a layer of 1" foam and on the top with a thick eggcrate foam padding. All corners are protected with a steel reinforcing cap. Draw bolt latches assure that the case remains closed. Most cases have one carrying handle, however the 6"f12 case has three handles.

The cases were designed to accommodate the tube assembly with its dewcap. The following sizes are available.

	outside dimensions	
4"f6	30" x 7" x 7"	$ 80.00
4"f10	46" x 7" x 7"	$108.00
5"f6	38" x 8" x 8"	$ 96.00
5"f8 and 5.6"f7 StarFire	48" x 8" x 8"	$110.00
5"f12	68" x 8" x 8"	$158.00
6"f8	57" x 9" x 9"	$146.00
6"f12	81" x 9" x 9"	$214.00

EYEPIECES

Quality eyepieces are now available at affordable prices. We're importing these oculars to compliment our scopes and your budget. We just love the 32mm Wide Field eyepiece for low power deep sky observing. Why pay more?

1.25" sizes: 4 OR, 6 OR, 8 KO, 12.5 PL, 18 PL, 25 Pl, 40 PL. ..... $ 59.00
2" sizes: 32 WideField, 55 Plossl ..... $ 95.00

ALT-AZIMUTH MOUNT

This very fine imported item will be an ideal light weight mount for low power sweeping, comet hunting and terrestial viewing. It can be teamed up with the aluminum tripod for our smaller scopes. $375.00

NEW PRODUCTS TO WATCH FOR IN EARLY 1987

-Custom 6x7 camera adapter with field flattening optics for the Pentax camera body. When used with our new StarFire optics you can achieve observatory quality astrophotos.

-New, revised, whiz-bang German Equatorial mounting for our 6" and 7" scopes. This mount will retain the solid feel and performance that our customers have enjoyed with our present mount and provide all the niceties that make astronomy more enjoyable. Some of the features that will be incorporated into this mounting are:

- Large hollow axes
- Polar alignment scope
- Setting circles
- Fine adjustments in altitude and azimuth
- Manual slow motions in both axes with flexible cables
- High quality pulse motors for R.A. and Dec., matching electronics
- Pier and tripod versions available

-Larger scopes with high performance optics will be introduced early next year.

EXPANSION!!!!!
We are expanding our production facilites and staff so that we can better serve the advanced astronomical community with high performance products. ASTRO-PHYSICS IS AN INNOVATIVE COMPANY ON THE MOVE. Watch for our scopes at the next star party in your area.

ORDERING INFORMATION - When ordering by mail, be sure to include your complete street address. We cannot ship to P.O. box numbers. Illinois residents must include 6.25% state sales tax. Domestic orders are sent UPS, shipping charges collect. International orders are generally shipped via air or ocean freight, transportation collect.

METHOD OF PAYMENT - In case of long delivery times, we require 1/3 down (personal checks are fine for domestic orders). A cashier's check or money order is required for final payment. Personal checks require an extra 4 weeks to clear. International orders must be paid with an international bank draft in U.S. dollars drawn on a U.S. bank.