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GSO's New 10-Inch Classical Cassegrain

This scope melds 21st-century technology with an optical plan nearly 350 years old. Some amateurs may find the results pleasantly surprising.



GSO 10-inch f/12 Classical Cassegrain

U.S. Price: \$2,795
agenaastro.com

What We Like

First-class mechanical construction

Excellent optics

A reminder that classic optical designs are still viable for amateur astronomy

What We Don't Like

While the focuser is very good for many visual and photographic applications, an upgrade would be desirable for some critical uses with heavy eyepieces and cameras.

EVERYTHING ABOUT THE NEW

10-inch f/12 classical Cassegrain from Taiwan-based Guan Sheng Optical (GSO for short) says 21st century. There's its carbon-fiber truss-tube design, quartz optics, mirror coatings with 96% reflectivity, cooling fans, and a dual-speed, 3¼-inch Crayford-style focuser for starters. But to understand where my head was at while testing the telescope we borrowed from Agena AstroProducts for this review, you need to turn the calendar back to a time well before the Apollo Moon landings and indulge me for a bit of nostalgia.

Back then American amateur astronomy was very different from now. The big-aperture Dobsonian revolution and its emphasis on deep-sky observing wouldn't begin for more than another decade. The same was true for the astrophotography boom that followed the introduction of popularly priced Schmidt-Cassegrain telescopes. Owning a 6-inch Newtonian reflector marked you as a serious amateur, and we usually spent our time at the eyepiece staring at the Moon, planets, a handful of double stars, and the brighter deep-sky objects culled mostly from the Messier catalog.

Forget the internet, personal computers, smartphones, and social media

▲ GSO's 10-inch classical Cassegrain is a solidly built instrument that excels for viewing the Moon, planets, double stars, and many deep-sky objects. It does, however, require a solid mount to take advantage of its high-magnification performance.

flooding us with instantaneous astronomical information. Back then we got our astronomy fix once a month when *Sky & Telescope* showed up in the mailbox — you know, the metal kind on a post out by the end of the driveway. As I'd walk from the mailbox to the house the world around me seemed to fade into the background as I pulled the magazine from its manila envelope and began flipping pages.

The advertisements were as fascinating as the articles. Those slick Unitron ads on the back cover were mesmerizing since then, as now, refractors held a special place in the hearts of amateurs. Big reflectors also captivated my imagination. And then there were the Cassegrain reflectors. Most of the major telescope manufacturers offered them — Cave, Tinsley, and Optical Craftsman, to name a few. They were expensive, and that alone made them seem special. I'm sure I wasn't the only young amateur to dream about observing with one.

As the years passed, I learned a lot more about telescopes and observing than I knew then, but that didn't stop those early memories from surfacing as I unpacked the 10-inch GSO Cassegrain. And the best part? It was a fantasy fulfilled — the views through the scope surpassed what I'm sure I was imagining back in the '60s, even with the now-critical eye of an experienced observer.

What's Special About a Classical Cassegrain?

Given the plethora of modern telescope designs, it's reasonable to ask if an optical configuration from the 17th century has anything special to offer today. The short answer is that for many visual observers and some types of astrophotography it offers a lot. Like a Newtonian, it has only two mirrors so it is highly efficient at transmitting light, and it's 100% achromatic, focusing all wavelengths from ultraviolet through infrared to a single point. There's no need to tweak the focus when using different color filters, either for visual observing or astrophotography. There's also no front corrector plate that can dew up, and for many of us that's a huge plus.

The scope's f/12 focal ratio is very forgiving of eyepiece designs. One stop on my trip down memory lane involved

digging out a couple of 1963-vintage Edscorp Orthoscopic eyepieces from Edmund Scientific. They performed beautifully with the scope even though they can't come close to competing with modern designs that have larger apparent fields, which translate into larger true fields of view for a given magnification on any telescope.

It shouldn't be necessary to remind readers today, but it's still worth repeating that a telescope's f/number only affects the brightness of extended objects (think anything other than stars) focused onto an imaging detector. Stars appear the same brightness visually in any 10-inch telescope regardless of its f/number. And likewise, extended objects appear the same brightness for any 10-inch telescope regardless of its f/number as long as you are viewing with the same magnification.

Notes on Using the Scope

The GSO 10-inch classical Cassegrain is a first-class instrument. The optics proved to be excellent. They were perfectly collimated out of the box (Agena AstroProducts says it checks every telescope optically before it's shipped.) Images would snap into focus the moment you hit the sweet spot when focusing an eyepiece. The scope's mechanics are well designed and manu-

factured. But there are some things to consider when it comes to using this scope. Foremost is its relatively long focal length of 120 inches (3,048 millimeters), which, for visual use, makes it a high-magnification telescope. For example, I typically do low-power observing with a Tele Vue 35-mm Panoptic eyepiece, which on this scope yields a substantial 87× and a true field about $\frac{3}{4}^\circ$ wide — big enough to show the entire Moon, but still too small for some splashy open star clusters and showpiece nebulae and galaxies. The maximum field possible with a 2-inch eyepiece (limited by its barrel diameter) is only 53 arcminutes.

For the other end of the magnification spectrum, I used a Tele Vue 3.7-mm Ethos eyepiece yielding 824× and an 8-arcminute field. That's beyond the oft-recommended top magnification of 75× per inch of telescope aperture, and it's a testament to the scope's fine optics. I resorted to this seemingly ridiculous magnification when splitting some of the challenging double stars listed in Phillip Kane's article on finding a telescope's Dawes limit (*S&T*: September 2016, p.30). For the record, the scope easily split SST 359 in Hercules with a separation of 0.75 arcsecond, so I have little doubt that under good observing conditions it would

▼ *Left:* More so than with some optical designs, a Cassegrain's performance is sensitive to optical collimation. The scope was perfectly collimated out of the box, in part thanks to its rigid secondary-mirror assembly. *Right:* Well-made light baffles keep extraneous sky light from the scope's focal plane on axis, but a small annulus of light around the secondary mirror can reach the edge of some 2-inch eyepieces. It did not present a problem during the author's visual and photographic testing.





◀ *Far left:* The mounting base for the focuser has tip/tilt adjustments to aid with precision collimation and squaring equipment to the scope's optical axis. A trio of small fans powered by a supplied battery holder for eight AA batteries helps acclimate the primary mirror to ambient air temperature. *Left:* Heavy-duty, tight-fitting plastic dust covers for the primary and secondary mirrors protect the optics when the scope is stored.

split doubles at its Dawes limit of 0.46 arcsecond even though poor seeing and clouds foiled my attempts to prove that by observing 51 Aquarii.

The basic scope weighs 38 pounds (17 kg), and a finder, star diagonal, and eyepiece add a couple more. As such, it needs a solid mount, and I found it a good match for my 12-year-old Astro-Physics Mach 1 German equatorial. But here's the rub. For last January's lunar eclipse I put that mount on a temporary aluminum pier made from 5-inch electrical conduit. It was fine for the small scopes used for the eclipse but totally inadequate for the 10-inch Cassegrain. High-magnification views jiggled like a bowl of Jell-O. I had to switch the Mach

1 to a permanent pier made from a scavenged steel streetlight pole 8 inches in diameter. It simply drives home the point that you need a very solid support to enjoy using this scope at high magnification.

There are two Losmandy-style dovetail mounting bars on the GSO scope. Equipped for typical observing or photography, the scope's balance point falls near the center of these dovetails, but be aware that the bars are only 10 inches long. When the scope was balanced in the long saddle of my Mach 1 mount, neither of the saddle's two clamps would engage the scope's dovetail bar. This might not be a problem for short saddles or ones with three or more clamps, but I had to mount my own long dovetail bar to the scope to make it work with my setup.

The scope's focus falls a generous 9½ inches (about 240 mm) outside the rear cell. The tip/tilt adjustable mounting base for the focuser consumes 1½ inches of this back focus, and the focuser another 3½ inches, but that still leaves plenty of space for a complex camera setup with a filter wheel and off-axis guider. The scope comes with three extension tubes (a pair 1 inch long and one 2 inches long), giving you a huge amount of flexibility in positioning the focuser the right distance from the rear cell for various visual and imaging setups. The downside is that the focuser

has only 2 inches of travel. This was adequate for most of my eyepieces and a star diagonal without using extension tubes. But adding a Barlow lens often meant having to add one of the extensions — a bit of an inconvenience.

For much of my observing the dual-speed focuser was fine. But some of my heavier eyepieces required putting a fair amount of tension on the focuser's drive shaft to keep it from slipping, and that made the fine-focus knob feel spongy and even slip at times. It wasn't a show-stopper, but for critical high-magnification observing with heavy eyepieces it would be nice to have the precision control that a quality rack-and-pinion focuser offers. The same goes for imaging with heavy camera setups.

Photographic Performance

Speaking of imaging, this classical Cassegrain is superb for lunar and planetary work, but for wide-field deep-sky photography, it has limitations that go beyond its relatively slow f/number. Even at the edge of the 40-arcminute-wide field captured by a full-frame DSLR camera, stars showed the noticeable effects of a Cassegrain's inherent coma. There are more reasons than just faster f/numbers that make modern optical designs preferred by today's deep-sky photographers working with large-format cameras. Even so, as the images here prove, for some of the smaller and brighter deep-sky objects, especially open and globular star clusters, the 10-inch GSO Cassegrain does a great job. Had I shown up at



◀ The first quarter Moon nearly fills the long dimension of a full-frame DSLR thanks to the scope's relatively long, 3,048-mm focal length.



◀▶ While some might consider f/12 slow for deep-sky imaging, the 10-inch Cassegrain made up for its lack of photographic speed by offering substantial resolution for small, bright objects. These views of M13 (left) and M27 (above) were each assembled from a stack of ten 5-minute exposures with a Nikon D700 DSLR camera set to ISO 400.

an astronomy-club meeting with these images in the '60s, people would have been flabbergasted. I would have been flabbergasted too, and to prove that point to myself I made the images with a DSLR set to ISO 400 — homage to the cameras and Kodak Tri-X film that was state of the art back then.

Observing Impressions

This is a hardware review and not an observing article, so I can't take a lot of space to wax poetic about the time I spent observing with the GSO Cassegrain. But it was a lot of fun. On several sultry nights last summer, armed with *Sky & Telescope's Pocket Sky Atlas*, I tracked down hundreds of targets along the Milky Way from Sagittarius to Cassiopeia. My light-polluted sky took its toll on faint nebulae, but many double stars and star clusters were simply

beautiful at magnifications of about 150×, showing subtle star hues with unusual purity. Bumping the magnification up to 305× with a Tele Vue 10-mm Delos eyepiece made easy work of distinguishing many tiny planetary nebulae from surrounding stars — something that isn't as easy using the same eyepiece on my 12-inch f/5 Dobsonian, because the magnification is barely half that of the 10-inch Cassegrain.

From my backyard observatory this past summer, Jupiter and Saturn were only visible as they skimmed the treetops after dusk when the heat of the day was still shimmering up from the foliage. As such, the seeing was poor, but there were still moments when the views were excellent. Those and the success I had observing the Moon in a

higher sky make it clear to me that the scope is a superb planetary instrument.

For the types of observing and imaging mentioned above, I can highly recommend the 10-inch GSO classical Cassegrain. There are other choices for wide-field observing and astrophotography, but in many respects those instruments can't compete with a Cassegrain when it comes to the Moon, planets, double stars, and star clusters that have been hallmarks of observers for several hundred years. For these objects a classical Cassegrain really does excel.

■ One reason **DENNIS DI CICCIO** finds astronomical nostalgia intoxicating is because observing the night sky remains every bit as exciting now as it was when he was a teenager.

▶ The scope is a superb instrument visually and photographically for the Moon and planets. These images of Copernicus (left), Gas-sendi (middle), and the southern shore of Mare Humorum with crater Vitello (right) were made with a Celestron Skyris 618M video camera at the scope's f/12 focus.

