

WHAT CAN YOU SEE FOR \$500? FOUR DIFFERENT TELESCOPES COMPARED

It's an exciting time to get involved in amateur astronomy. There are more choices and more good buys available now than there have ever been. It is also easy to find independent telescope reviews over the Internet.

My favorite Internet telescope review sites are "scopereviews.com" by Ed Ting, "weatherman.com" by Todd Gross, and "cloudynights.com" which features reviews submitted by amateur astronomers. I hope to submit a version of this review to "cloudynights.com".

The four telescopes reviewed here have all received favorable comment in magazines or on the Internet: The Meade ETX90, the Celestron C102HD refractor, the Celestron G5 SCT, and a 10 inch Dobsonian reflector. The 10 inch Dobsonian belongs to the Eugene Astronomical Society, the other three I own myself.

The Meade ETX90 received such a glowing review in Sky and Telescope magazine that Meade reprints the review in its advertising. Todd Gross says the Meade ETX90 shows one of the best star test results he's ever seen. Ed Ting, on the other hand, was disappointed. I recall someone commenting; "The only thing I missed after selling it was the eyepiece." I agree with both reviewers, my ETX90 shows a nearly perfect star test, but it does not, in my opinion, outperform larger telescopes.



The Celestron C102 receives much favorable comment in Internet chat groups. Ed Ting says, "If all of them are as good as mine, these new C102HD telescopes must qualify as a major bargain." Reviews of similar refractors by Alan Dyer in Sky and Telescope magazine were not so rosy. Says Dyer, "When viewing bright objects, I was almost always conscious of some false color. Furthermore, at high power bright stars looked pale green, not white." Again, my experience largely confirms the reviews. I brought my C102HD to the 2002 Astronomy Day event last April 20 in Eugene, Oregon, specifically to give people a good look at the planet Jupiter. Some of the children commented on the blue glow surrounding the planet, a symptom of the chromatic aberration seen in low cost refractors. Even so, sharp eyed children were able to spot four or five dark bands on Jupiter's surface.

The Celestron G5 is a compact Schmidt-Cassegrain telescope on an equatorial mount, with the optical power of a five inch telescope in a much smaller package than traditional refractors or reflectors. Todd Gross compared the C5 with a Takahashi Sky90 compact refractor, and found the views very similar. The Takahashi sells for four times the price of the C5. I like the G5 because it is small enough to leave the telescope set up, ready to take outside for a quick look. The sharpness and contrast are just a shade below the C102, but the images are noticeably brighter.



In this review I compare these telescopes with a ten inch Cosmos brand Dobsonian reflector belonging to the Eugene Astronomical Society, my local astronomy club. The ten inch has a focal length of about 45 inches, f/4.5, so the focal length of all four telescopes ranges from 40 inches for the C102 to fifty inches for the C5 and the ETX90. I used a Celestron 32mm plossl for low power views of the “double cluster” in Perseus and Televue 10.5mm and 7.4mm plossl eyepieces for high power views of Jupiter and Saturn. I sometimes added a Celestron Ultima barlow for high power views of the “double-double” E-Lyrae.

I looked at a number of well known favorites several times with each telescope so that I could fairly describe what I actually saw. As always, your milage may vary.

The star Epsilon Lyrae is known as the “double-double” because when you look at it with binoculars you can see two stars, but when you look with a telescope each star itself is a double star. Since the individual stars are only two arc-seconds apart, you are testing the steadiness of the atmosphere as much as you are testing a telescope when you look at the “double-double”. When I viewed E-Lyrae with the Meade ETX90, I could readily make out the individual stars. The stars showed a textbook diffraction pattern, with an obvious first diffraction ring, as though viewing a pair of overlapping bulls-eyes. This diffraction pattern is typical of a small telescope with a central obstruction created by the secondary mirror. The C5 also has a large central obstruction, and also showed obvious diffraction rings. The C5 doesn’t separate the stars quite as cleanly as the ETX90 because it shows more scattered light around the stars. The refractor design of the C102HD separates the double stars into sharp bright beads of light, with diffraction rings so faint they were hard to see at all. With the 10 inch Dobsonian telescope, the view depends much more on the steadiness of the atmosphere. Astronomers call this atmospheric steadiness “seeing”. When the seeing is poor, the 10 inch would blur the stars together. When the seeing was good, the 10 inch easily separates the individual stars. Over all, I’d have to say the C102 refractor gave the most pleasing views, showing the individual stars as bright beads of light with little evidence of scattered light or diffraction.

The “double cluster” in Perseus has been one of my favorites since I started viewing the sky with binoculars. It’s a wonderful sight in the ten inch Dob with the 32mm eyepiece. One night at Pine Mountain Observatory, East of Bend, Oregon, two couples looked at the “double cluster” in the 10 inch and declared it was the most wonderful thing they’d seen all night, and this was after looking at other objects in the Observatory’s 15 and 24 inch scopes. The 10 inch easily brings out the colors in the clusters’ red, yellow, and blue-white stars. The C5 shows yellow stars easily, but the red stars are more subtle and the blue-white stars are simply white. The C5 also exhibits curvature of field using the 32mm eyepiece. When stars are sharply focused near the center of the field, they are out of focus at the edge. The C102 has the widest

view, with pin-point stars filling the 1.5 degree field of the 32mm eyepiece. Colors are subtle at best, and the blue white stars actually look pale yellow-green, just as Alan Dyer described in *Sky and Telescope*. The Meade ETX90 shows pinpoint stars to the edge of the 32mm eyepiece, but the colors are barely noticeable. The 10 inch wins here for bringing out the star colors.

Globular cluster M13 in Hercules is another crowd pleaser. The 10 inch shows star chains leading away from the sparkling core when viewed with the 10.5mm plossl. It reminds me of an Angel fish with whiskers, fins, and tail. The C5 shows the fins and tail of the Angel fish, although faintly, and resolves many stars in the core when power is increased with the 7.4mm plossl. The C102 hints at the fins and tail chains, and the core sparkles; the telescope is just big enough to hint at details but they are faint. Can you resolve individual stars in M13 with an ETX90 as Meade ads suggest? Yes, but they are so faint and hard to see that the view is not satisfying. I convinced myself that I could resolve stars in M13 with the ETX90 by looking at nearby M92 and resolving stars there as well. It takes a dark viewing site, but it can be done. Aperture wins again here, the 10 inch easily brings out more detail.

Jupiter and Saturn are wonderful objects to view in any telescope, but it takes high magnification to bring out the details. Will aperture win here as well? There are two problems with high power viewing with a Dobsonian; objects become hard to follow if the scope does not move easily, and the mirror takes literally hours to cool. My best results viewing planets with the 10 inch Dob came in the wee hours of the morning, after leaving the scope to cool all night in a covered car port.

On the very best of nights, Saturn's Cassini division is sharp and black in the 10 inch, and the Crepe ring is easily seen. The planet shows an apricot colored temperate belt, and shading colors the A and B rings. In the C5, the Cassini division looks grey rather than black, and the detail in the rings is not as crisp, but I can make out the Crepe ring and the moons Rhea, Dione, and Tethys on a good night. The C102 easily beats the C5 on the Cassini division. Using the barlow and the 10.5mm plossl for a magnification of 200X, I've been able to make out shading in the A and B rings and glimpse the Crepe ring. The C102, however, does not pick out the smaller moons quite as easily as the C5 does. The ETX90 shows the Cassini division as a tan stripe coloring the rings, not as a dark gap between the A and B rings. This is understandable, the Cassini division is only about 1/2 arc second wide, and the smallest spot resolved in a 90mm scope is 1.3 arc seconds across.

The constantly changing cloud bands on Jupiter are so fascinating that I can easily watch them for hours, forgetting to look at other objects in the sky. The details are subtle, however. If the mirror isn't cool in a reflector, the view will be disappointing. On the occasions that I've set up the 10 inch and one of the smaller scopes side by side to look at Jupiter, I usually wind up looking thru the Dobsonian the least. When I combine the barlow lens and the 10.5mm plossl for a magnification over 200X, I can see lots of detail, but I can't keep the planet in the field of view! If I change to a lower power I can find the planet again, but then I have to re-focus. It's just not worth the trouble.

On January 15th, 2002 I made the following notes, observing with the C5: "*Good detail at 100X and 170X. NEB reddish brown, SEB doubled, dark grey. Equatorial region yellowish, NTB present, N polar region shaded. 1 or 2 STB seen in best moments.*" The C5 easily shows moon shadows crossing the face of Jupiter, and on February 5th, I actually watched the distinct grey disk of Jupiter's largest moon Ganymede crossing the planet just below the South Equatorial Belt. If anything, the views of Jupiter in the C102 are even more impressive. The best view in the C5 showed me six dark bands, the South Temperate Belts fading in and out of

view. The best view in the C102 showed me seven solid dark bands. At Astronomy Day on April 20th, sharp eyed children were able to see four or five dark bands even though Jupiter was well past opposition by this time. Once again, the ETX90 sits in back of the bus. The ETX90 showed me three dark bands, the North Equatorial Belt as reddish brown, and showed the North Temperate Belt. But the diffraction rings seen around stars also can be seen around the moons of Jupiter at any magnification over 100X or so. The image of Jupiter at magnifications over 100X just never seems as sharp in the ETX90 as it does in the C5 and the C102.

On paper, you ought to get more detail on the planets with a larger telescope. Indeed, I have seen wonderful views of Saturn and Jupiter with Dobsonian telescopes, but it takes patience and practice. For someone starting out in astronomy, I think a small refractor like the Celestron C102HD has an edge over the larger reflector because you can carry it outside and get outstanding views of the planets without the long cool down time and patience a large reflector requires. I found that the C102 also edges out the C5 and the ETX90 in sharpness and contrast when viewing the planets.

“How much does a telescope like this cost?” is one of the commonest questions at public star parties. The truth is, you can see a lot with a modest \$500 telescope. Eight and ten inch Dobsonians show wonderful detail on star clusters and deep space objects. Good, usable 8 to 10 inch Dobsonian telescopes can be purchased brand new for \$400 to \$600 dollars. The C102HD imported by Celestron and the 120mm f/8.3 achromatic refractor imported by Orion are also good values if you don't mind a little false color.

Which one did I choose to keep? Like some other hobbyists I know, I couldn't choose just one. I decided to sell the C102HD and the ETX90, and keep the G5. The G5 is not sharper than the C102HD, but it is almost as sharp now that I have the secondary well centered and collimated. I like the G5 because I can leave it set up and carry it outside ready to go. But the G5 is not my only telescope. I also have access to a wonderful homemade 12" f/7 Dobsonian on a very solid plywood mount. And one of our local club members has an even more wonderful 18" scope. Can you say “aperture fever”?

Oh well, like I said at the beginning, it's never been easier or more fun to get into amateur astronomy.



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