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A quiet evening with 4 zoom eyepieces - a casual comparison

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From left to right (Leica, Vixen, Orion, Nikon and 26mm Meade super plossel)

I find there is nothing harder to compare and review than eyepieces, particularly ones from the same category. Differences can be subtle and merely finding them is only half the tale. What they mean and where the differences come from must also be explained. Throw into the mix particularities of the telescope being used as the test instrument and you must account for the effects (if any) of the optical train. Due to all the above I have a healthy dose of respect for those who make the effort to compare eyepieces. Also due to the above I decided to simply enjoy myself and give readers a casual comparison of four zoom eyepieces. I hope to solicit an experienced eyepiece reviewer to send these four zooms to and have them write up a detailed and comprehensive comparison.

I've had the notion of a zoom comparison for a little over six months as I've felt this category of eyepieces have received an unjustly bad reputation. Common wisdom states that a zoom eyepiece has the following deficiencies and as such is not really the tool of a serious observer;

1. Restrictive fields of view at their lowest power (typically around 40 degrees at 24mm - see table below)
2. 7-8 elements which dim the overall view
3. Views not up to the quality of non-zoom eyepieces

Defenders (and users) of zoom eyepieces cite the following as the advantages of zooms;

1. Ability to dial in the precise and perfect magnification for viewing an object - something that is impossible with an eyepiece collection
2. Only have to bring out one eyepiece for an evening of viewing
3. Views up to the quality of non-zoom eyepieces
4. Reasonably priced way to obtain an entire eyepiece collection

So who is right and who is wrong? Well, to answer that we'll need some folks to step forward and write some reviews and commentaries. Here is my small contribution to kick things off.

Meet the zooms

Vixen LV zoom (aka Televue zoom, aka Celestron LV zoom)

Topping off the popular lanthanum series of eyepieces, Vixen offers its LV zoom eyepiece. Sporting between 15-20mms of eye relief, this zoom has been the only game in town for eyeglass wearers. Eight elements (with one element being composed of lanthanum - hence the name) and having a range of magnification from 8mm - 24mm, this zoom remains the most popular and well known zoom here in the US. It is also resold under the Celestron and Televue brand name with qualifiers by Televue that they perform additional quality control checks

Orion Ultrazoom

From the same company that owns the exclusive Vixen dealership in the US comes the Orion Ultrazoom. Sold only by Orion, it is described as having 7 elements and a range of magnification from 7mm - 21m. No eye relief ratings are given nor how Orion feels it is distinguished from their Vixen LV zoom.

Nikon Zoom

Nikon has a zoom? Start talking to folks about the Nikon zoom eyepiece and this is the response I receive 8 times out of 10. The Nikon zoom eyepiece has actually been around for some time but has remained a quiet secret known only to those who rub elbows with the spotting scope crowd. The Nikon zoom begins life as an accessory to the Nikon 78ED fieldscope. Markus Ludes of APM Germany modifies the non-standard barrel to fit the 1.25" format of astronomical telescopes. 7-21mm magnification range and a nice disclaimer that it is designed for scopes all the way down to F/6.

Leica Zoom

Don't they make binoculars? The only zoom eyepiece in the world that is less known than the Nikon is the Leica zoom (and this is a true shame). Leica is generally known for their superb binoculars and to a lesser degree, their spotting scopes. Unless you happen to be a birder you would never know that Leica makes one of the best zooms in the world (oops, I'm giving away the article early here). A 2" zoom eyepiece (yes 2") which is provided with a pop-on 1.25" adapter and a range of magnification from 7.3-22mm. Available from APM Germany. Note - I own and review here the latest version of the Leica zoom which became available in the Fall of 1999.

Here is a table summary of the specs:

	Focal Length	FOV *	Eye Relief **	Price
Vixen LV	8mm - 24mm	60 deg - 40 deg	15-20mm	\$189.00
Orion Ultra	7mm - 21mm	65 deg - 35 deg	not stated	\$189.00
Nikon	9mm - 21mm	60 deg - 38 deg	18mm	\$199.00
Leica	7.3mm - 22mm	68 deg - 38 deg	20mm	\$295.00

* FOV for zooms corresponds to the focal lengths in column #1 (i.e. Vixen at 8mm has 60 deg fov)

** Eye relief stats are from the reseller

A casual evening

I recently received a used ETX-90 for another project I would be playing on in the near future. The zoom eyepiece comparison gave me a reason to break it out and play so it became the evenings test instrument to try the zooms out on.

Lining the zooms up on the table (photo) you quickly note how incredibly small the Nikon zoom is. Picking it up you surprisingly notice that is almost exactly the same size AND weight as the Meade 26mm super plossel. I asked Markus how many elements were in the Nikon zoom and he confessed he didn't know, as he hasn't taken one apart yet. Based on weight I would guess between 5-6 elements, more on this later.



From left to right (Leica, Vixen, Orion, Nikon and 26mm Meade super plossel)

Comparing the top lens I noted the Leica and the Vixen LV are similar in size (big) with the Leica being slightly larger. The Nikon and the Orion Ultrazoom are also identical in size (medium). This is odd, as I would have expected the Vixen and Orion to have like size eye lens since their bodies and specs are so similar. Compare yourself in the photo above.

I should mention that I've used these zooms on and off over a period of two weeks so this isn't my first introduction to them. It is, however, the first time I put all four back to back. The waxing moon provided me with a perfect first target of the evening. Initial test would be to frame the moon at the zooms lowest setting (between 21mm - 24mm - roughly 56x on the ETX) and simply note differences if any existed.

Second test was to zoom each eyepiece to its middle setting and once again note any differences.

Last lunar test was to put each zoom at its highest magnification setting and once again note the differences.

Results of lunar test

Tunnel Vision (a rather subjective category)

One oft cited problem with zooms is at their lowest magnification settings, the fov is rather restricted. At between 36 deg - 40 deg FOV these zooms can show a smaller swath of the sky than standard orthos. However, the numbers simply don't tell the whole tale.

While having a stated 38 deg FOV, the Leica won this test hands down. The Leica at 22mm doesn't even give a hint of tunnel vision that is apparent in varying degrees in the other zooms. A good deal of this is probably due to its huge eye lens (bigger than the 26mm super plossel) but some of it is in part due to a very well designed optical path. Any zoom that starts off as a pleasure to use at its lowest mag can only get better as you dial up the power.

The Nikon came in second in the tunnel vision effect by sitting on the threshold of noticeability. The Vixen came in a close 3rd while the Orion trailed far behind. The Orion is the worst offender of tunnel vision. A 35 deg fov at 21mm it makes you feel every bit claustrophobic. The edge stop is very prominent and I quickly found myself wishing for a plossel instead.

Moving through the range of magnifications the Orion came out of its slump by expanding its field of view at a faster rate than the Vixen. By this I mean the FOV widened earlier on the Orion (mid - upper teens) than the Vixen. Like the rabbit and hare fairy tale the Vixen's fov widens at a steady pace while the Orion leaps out of the gate. I didn't note the specifics and hope someone else can fill in these numbers.

Like the Vixen, the Leica and Nikon's FOV opens at a steady pace until the Leica hits around 10. Then like a sprinter that has been loafing it seems to explode the FOV out in the last 4mm. It is rated at 68 degs at 7.3mm but to me it felt like 75-80 deg FOV. I had to literally move my eyeball around to take in the entire FOV on the moon at 7.3mm. This is one of two ratings on the zoom eyepiece lineup that I question. I think the FOV for the Leica is larger than the stated 68 degs. I could be wrong and can only check by doing a comparison with a 7mm Nagler.

Sharpness (on axis and off)

The Nikon won this category. I found the Nikon to be the sharpest zoom of the bunch with the Leica biting at its heels for 2nd place. Interestingly enough, the Orion was sharper on axis than the Vixen LV zoom. As I increased the power, the Vixen LV zoom appeared to gradually fall off in sharpness while the Orion hung in there to a higher (but not its highest) magnification. The Nikon and Leica shrugged off the increase in power and didn't show any effects one way or the other.

Eye Relief

The Vixen and Leica tie this category. Both maintained generous amounts of eye relief at any power. Something noticeable is the Leica is more forgiving in head position than the Vixen at higher powers.

The Nikon came in a close second but its rated eye relief of 18mm felt like it had dropped to around 12-13mm at its highest setting. Here the Orion fell out of the race completely. By the time you hit 10mm on the Orion the eye relief is roughly 8mm and below. If you wear eye glasses or eye relief is important to you then keep away from the Orion Ultrazoom.

Results of Deep Sky test

Contrast

Choosing the Orion Nebula I reset the zooms back to their lowest settings and swapped each one through in turn. It was on this test I realized how appropriate the ETX-90 was. An obstructed 90mm scope is a little challenged in light grasp on deep sky. Any advantage an eyepiece can give is rather noticeable in this scope. It was here that the Nikon began to show its stuff.

In examining the wispy clouds of M42, the Nikon showed more detail than any of the other 3 zooms. The light throughput of the Nikon is truly amazing when compared against other zooms. Earlier I had alluded to the idea that the Nikon zoom has between 5-6 elements based upon weight. Its amazing light throughput on M42 lends further evidence to this theory. Lines that were on the threshold of visibility in the other 3 zooms were seen without problems in the Nikon.

The Leica came in second in this category with the Vixen and Orion tying for last place. However, once again the Leica gave a very pleasing image due to its remarkable ability to make its lowest magnification seem larger than it really is. This is a rather difficult thing to describe yet I felt it each time I used the Leica.

Increasing power on M42 quickly left the Vixen in last place, details started to be lost at points where the other 3 showed them. Next to drop out was the Orion followed by the Leica and lastly by the Nikon. This lends further evidence that the Nikon has a greater light transmission than the other three zooms.

Summary - which did I buy?

Well, that wraps up my one shot at eyepiece comparisons and I hope another author will step forward to write a really comprehensive comparison of these 4 zooms. Take what I have written above with a grain of salt when it comes to some of the specifics as many of them are subjective calls. I do stand by some of the generalities and think other authors will find the same general results.

For me (and me only) the winners are a tie and I will end up using both the Leica and Nikon in my observing session depending upon the instrument used. For smaller, aperture challenged telescopes I will use the Nikon as its higher light transmission will be truly appreciated. For larger scopes or brighter objects I will use the Leica as it is the most comfortable and extraordinary zoom eyepiece I have ever used. If I had to choose one (and I'm lucky I don't have to at this point in time) I would choose the Leica.

That's all!

Addendum

I've received some feedback from folks who report they don't use zooms because it doesn't give a wide field view at it's lowest magnification (24mm). These folks feel that for deep sky hunting, a wide field, low power eyepiece is needed and the various zooms simply don't give this. To these people I would say, you're right. However, you're also throwing the baby out with the bath water. Allow me to explain.

When I use a zoom eyepiece I use it in conjunction with a 2nd eyepiece which is typically a 2" wide field eyepiece in the 32 - 40mm range. I use the 2nd eyepiece as my "finder" eyepiece. Once I have the object centered, I switch to the zoom and dial in the perfect magnification for the found object. Using such a system gains me an immense swath of sky for finding objects.

Here is a simple example on a 10" F/4.5 dob (1150mm FL)

8-24mm zoom (at 24mm)	40 deg	47x	1.2 deg FOV
35mm TV Panoptic	65 deg	32x	2 deg FOV

For some reason there is a fundamental misunderstanding that if you purchase a zoom eyepiece it must be the only eyepiece you can use during your observing session. While you can follow this philosophy for quick observing sessions, I suspect most folks will benefit further from adding a 2nd 2" eyepiece.

Lastly, I've found that during my sessions (and mine only) if I pull out an eyepiece case full of eyepieces, I end up fussing around and switching between eyepieces for the "perfect" view. Over time I've noted that this gains me little and eats up a good deal of my precious observing time. Experience has taught me that I gain more from each session if I limit the number of eyepieces I take with me. In the past this has been 3-4 spaced eyepieces but nowadays I find I use a quality zoom and a wide angle 2" eyepiece a good deal of the time. This system works quite well for me and I'd love to hear (and post) the systems others are using for their observing sessions. Remember, the perfect system for you is the one that gives you the most satisfactory observing session. Hope to hear from you all.

Addendum #2 (05/29/00)

Two months have passed since I performed the last addendum and I've kept all four zooms to see which one(s) I would use. Over time I use the Leica zoom unless there was a specific need otherwise. The Nikon was used less than I thought, not because I found any problems, but I was willing to give up the slight light loss of the Leica over the Nikon for the marvelous view the Leica provides. The Leica is a clear winner to me and one I use on a regular basis. The one exception to this is solar observing. For reasons unclear to me the Nikon is the clear winner for solar observing and remains in the diagonal of

my ST80 for just that purpose.

As for the Vixen and Orion, their positions changed. When I first received the Vixen I favored it over the Orion due to the Vixens longer eye relief. However, I found over time that I preferred to use the Orion over the Vixen due to the Orions sharper on-axis performance. This surprised me and like the solar observing above, one I wouldn't have been able to predict unless I owned all four zooms simultaneously.

One variable I completely forgot to mention but several readers reminded me to include, is a comparison of the mechanicals. Each zoom changes magnification by twisting a ring near the top of the eyepiece. Each zoom differed by the amount of force required to twist this ring and change the magnification. On this variable the ranking changes drastically. The Nikon and the Orion are at the top of the heap by only requiring ones finger and thumb and a small amount of pressure to twist. The Vixen comes in second by still only requireing a finger and thumb but a greater amount of pressure. The Leica comes in dead last as it requires a thumb, two fingers and a good deal of pressure to twist.

Well, this ends my zoom eyepiece comparison adventure. Overall I'm quite pleased to have found the Leica zoom and will bring it to star parties, etc to give folks a chance to try it out. The Nikon is also a keeper but has been regulated to the role of dedicated solar observing eyepiece.

That's all