Snake River Skies
A publication of the Magic Valley Astronomical Society

November 2008 Monthly Newsletter

Magic Valley Astronomical Society Monthly Meeting

- Saturday Nov 8th 2008
- Rick Allen Room, Herrett Center for Arts and Science College of Southern Idaho
- 7:00 p.m.
- Wallace Blacker will be the guest speaker
- Nominations for Officers for 2009 will be taken.

Inside this issue:

Message from the Board of Directors

November brings colder temperatures and sometimes cloudy skies, however, when the skies are clear they are quite beautiful. As we say goodbye to fall, we begin to make preparations for the upcoming year. There are some society items of relevance to MVAS members.

Membership renewals for 2009, which we will start to accept this month. Your $20 fee covers your entire family and helps to provide our group with a broad range of enjoyable programs. Other prices may be in effect contact us for more details.

Pomerelle has again agreed to host an annual star party on the top of the mountain under the stars. Our date has been set for August 15th 2009 and pre-planning has already begun.

City of Rocks has likewise agreed to hold a star party for us. The date is to be announced.

Finally, we have completed the guest speaker and activities calendar for 2009.

Happy Thanksgiving to all members.

Dark Sky Location

A suitable dark sky location has been officially found. We will begin our “club only” star parties in the coming warmer months. The main reason for this will be access after the snows fly. Thanks to Chris Anderson and David Olsen for making the effort to find a location for the club. Details about the location and maps will be provided when the future dates are set.

The Eye – The Telescope Part 3 – The Eye Piece

Review of some optical terms

Purkinje effect

The tendency of the peak sensitivity of the human eye to shift toward the blue end of the spectrum at low illumination levels. It can affect visual estimates of variable stars when using comparison stars of different colors, especially if one of the stars is red.

Dark adaptation

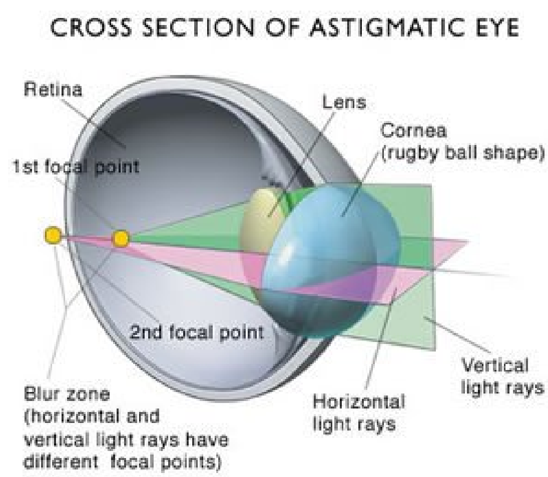
Heightened sensitivity to light when the eye is subjected to darkness for an extended period. Chemical changes take place in the retina, mostly in the first 20 minutes in darkness but continuing for up to two hours that greatly improve the observer's ability to see faint objects. However, they can be cancelled quickly by a sudden exposure to light, which is why amateur astronomers carry red-filtered flashlights into the field for use for reading star charts, setting circles, and telescope controls.

Averted vision

Looking at a faint object "out of the corner of the eye" – with peripheral vision – in order to detect it more easily. This method takes advantage of the fact that the most optically-sensitive part of the retina (the layer of cells at the back of the eye) is off-center. Two kinds of light-detecting cells make up the retina: cones and rods. The cones support high light-level, color vision, while the rods are for low-light vision. In the human eye there are about 5 million cones and 100 million rods. The cones occupy a small spot (the fovea) centrally located on the retina, whereas the rods surround the cones and cover a much greater area (the macula). An observer can multiply light sensitivity many times by slightly averting the head so that the projected image from an eyepiece falls onto the retinal region of high light-sensitivity.

Astigmatism

Astigmatism in human vision happens when the front part of the eye – the cornea – (or sometimes the eye lens itself) is not perfectly regular and symmetrical in shape. If the cornea is more oval than round (like the back of a spoon), then light passing through it isn't focused properly on the retina at the back of the eye. This results in a blurring of vision at all distances.



Astigmatism is very common and is usually present from birth. Most people have a slight astigmatism because it's rare for the cornea to have developed in a perfectly symmetrical way. But in mild cases, the eye can adjust to focus the light adequately.

In many cases of astigmatism the person also has other visual problems such as nearsightedness (myopia) or farsightedness (hyperopia). Two-thirds of people with nearsightedness also have significant astigmatism.

The eyepiece will not compensate for moderate to high astigmatism. Myopia and hyperopia can be compensated for by moving the focus in and out.

Seeing

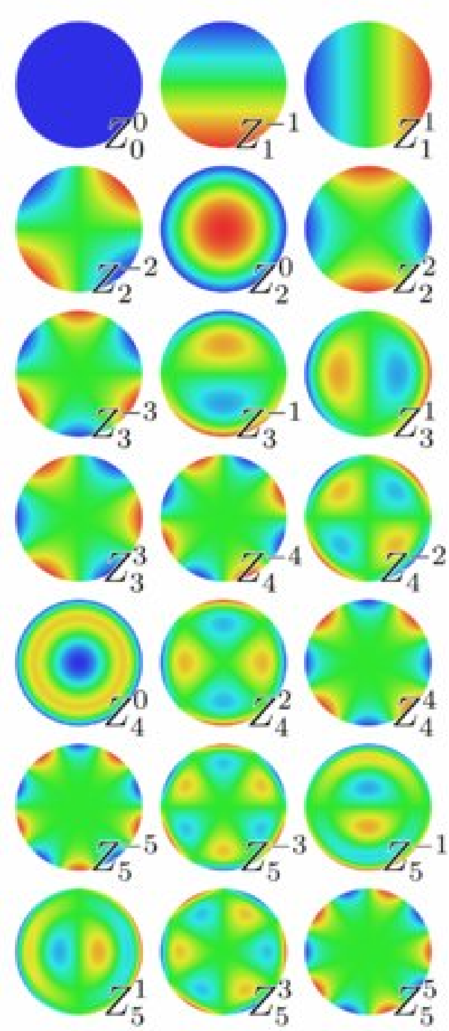
The blurring of a stellar (point-like) image due to turbulence in Earth's atmosphere. Seeing estimates are often given in terms of the full-width in arc seconds of the image at the points where the intensity has fallen to half its peak value. The typical value at a good site is a little better than 1". Amateur astronomers often used the five-point Anontiadi scale, which rates seeing as I (perfect), II (good), III (moderate), IV (poor), and V (very bad).

Optical Aberration Of The Eye And Optical Lenses

The Zernike polynomials are a set of orthogonal polynomials that arise in the expansion of a wavefront function for optical systems with circular pupils.

Aberrations fall into two classes:

- Monochromatic aberrations (Gr. *monos*, one) produced without dispersion. These include the aberrations at reflecting surfaces of any colored light, and at refracting surfaces of monochromatic light of single wavelength. These include:



o Piston

o Tilt

o Defocus

o Spherical

o Coma

o Astigmatism

o Curvature of field

o Image distortion

o Chromatic aberrations (Gr. *croma*, color), where a system disperses the various wavelengths of light

o Axial, or longitudinal, chromatic aberration

o Lateral, or transverse, chromatic aberration

Piston and tilt are not actually true optical aberrations, as they do not represent or model curvature in the wave front. If an otherwise perfect wave front is "aberrated" by piston and tilt, it will still form a perfect, aberration-free image, only shifted to a different position. Defocus is the lowest order true optical aberration.

Eye Relief

Eye relief is the distance from the last surface of the eye lens of an eyepiece to the plane behind the eyepiece where all the light rays of the exit pupil come to a focus and the image is formed. This is where your eye should be positioned to see the full field of view of the eyepiece. If you must wear glasses because of astigmatism, you'll need at least 15mm of eye relief or longer if you want to see the full field of view with your glasses on.

A note on our eye relief figures: Quite often, our eye relief figures will differ from those of the manufacturer. This is because we measure the "usable" eye relief, while the manufacturers specify their usually-longer (but technically correct) "designed" eye relief.

The eye lens of the eyepiece is normally recessed below the rubber eye guard or rubber rim of the eyepiece to keep the lens from being scratched during use. An eyepiece might have a "designed" eye relief of 15mm (and the eye relief will truly measure 15mm from the eye lens to where the image forms). However, if the eye lens is recessed 3mm below the eye guard, the closest you can get your eye to the eye lens would be only 12mm (the 15mm "designed" eye relief, less the 3mm of eye relief made unusable by having the eye lens recessed into the body of the eyepiece). This "usable" eye relief of 12mm (measured from the rolled-down eye guard – the closest point you can get your eye to the eye lens – to where the image forms) is the eye relief figure that is most important in the field.

Why is it important to list the "usable" eye relief? For those people who don't wear eyeglasses while observing, a few mm difference between the eye relief they expect from the manufacturer's literature and the shorter eye relief they actually get in real life doesn't mean a lot. They can simply move a little closer to the eyepiece to see the full field. However, some people *must* wear eyeglasses while observing, because of severe astigmatism. These observers can't move closer to the eyepiece if the eye relief is shorter than they expected because their glasses get in the way. For these people, the real life "usable" eye relief is more important than the technically correct but sometimes not fully usable "designed" eye relief. We measure and list the actual usable eye relief so that people in the real world can pick the eyepieces that will work best for them.

Eyepiece

A combination of lenses, also known as an *ocular*, used to magnify the image formed by the objective of a telescope. In practice, eyepieces contain at least two lenses: the *field lens*, which faces the objective and collects the light from it, and the *eye lens*, which faces the observer and magnifies the image. A *field stop* (a circular aperture) inside the eyepiece limits the field of view, helping to give it a sharp edge. There are various types of eyepiece design, from very simple achromatic lenses to complex eyepieces with many optical elements. Usually, the more complex an eyepiece, the more optical corrections, and the better eye relief and wider field of view. On the other hand, adding many glass surfaces dims the image and may also increase internal reflections, or "ghosting."

Choosing Telescope Eyepieces

Eyepieces for telescopes come in many different designs to fit many different budgets. Here is an explanation of B&H´s terminologies as well as some tips on how to select them:

This designation refers to eyepieces which have an apparent field of view of 59 degrees or less and an eye relief of less than 15mm. The advantage of these types is that they are often small, less expensive, and less of an optical challenge for your telescope.



It is a good idea to space out the focal lengths of your eyepiece collection so that you can observe at different magnifications to match the conditions. Thus if your telescope came with just a 25mm eyepiece, it would make sense to buy another that was perhaps 30-40mm, one around 15mm or so, and one below 10mm.

Within one brand and style of eyepiece, it is often true that each eyepiece in that collection will be ***parfocal*** with the others. This means that when you switch eyepieces while observing the same object, the telescope will require little or no refocusing with the new eyepiece. This means less vibration to the scope and more real time enjoying the view at the eyepiece.

But the best advice of all is this; buy the best quality eyepieces that are within your budget. You'll use these every time you observe and they critically affect your viewing experience, so it is not similar to saving by buying a cheaper filter that gets used only occasionally.

Long Eye Relief

The distance from the top of the eyepiece at which your eye can be while still being able to see the entire field of view afforded by an optical device is known as the eye relief. When an eyepiece has minimal eye relief, such as 10mm or less, the entire view will not be possible to see for those wearing eyeglasses because their glasses extend more than 10mm beyond the front of their eyes. Additionally, short eye relief eyepieces can be tiring to observe with for those who don't wear glasses. It is very common for short focal length eyepieces, such as those of 10mm or less

Wide Apparent Field

An eyepiece can show a narrow slice of sky while seeming to have a view that surrounds your vision, just as easily as an eyepiece can show a wide chunk of sky while seeming to have a view that's narrow and further away in the eyepiece. This is because of "apparent field of view", which is a way to express the concept of how wide the view feels within the eyepiece itself. Nearly an observer enjoys a wide apparent view because it makes you feel like you're 'swimming' in space, but this does not come without disadvantages. Generally speaking, those eyepieces which have a wide apparent field will usually have less eye relief than an eyepiece which has a narrower apparent field. Additionally, telescopes which have a 'fast' aperture can expose an eyepiece's optical flaws, while the same eyepiece used on a 'slower' telescope can appear brilliantly sharp and free of distortions. If you have a telescope with an aperture of around f/5.0 and wish to use an eyepiece with a wide apparent field, you'll need to spend quite a bit of money to get a view which is enjoyable from edge to edge.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Wide Field/Long Relief
This designation is used to highlight eyepieces which achieve BOTH specialties of longer eye relief and a wider apparent field in one unit. These eyepieces are often large, heavy and expensive, but they will provide the best viewing experience for eyeglass users and those without eyeglasses.

Editor's Note: This is the final installment of Dr. Jay Hartwell's article on the eye. Hopefully you have enjoyed the information. Please take a moment to contact Dr. Jay and let him know your thoughts.

Trivia

Veterans Day in the U.S. which is also known as Remembrance Day in the Commonwealth countries (British Empire's sovereign rule) and Armistice Day in other countries, recognizes all veteran's who served in one of the five branches of the U.S. Armed Forces, as well as remembering the U.S. troops who died in past and present wars.

NASA has employed many veteran's over the years most notably those who began with the Mercury Program. It was for many years before NASA turned to a civilian astronaut program to augment their veteran core groups. Two of the most famous veteran's was Astronaut Neil A. Armstrong and Buzz Aldrin, who on July 20th 1969 became the first astronauts to walk on the moon.

Russia and China likewise employ military personnel in their space programs.

The symbol for Veteran's Day is, of course, the American flag which is to be flown at half-mast. In the Commonwealth countries the symbol is a red poppy worn over the left lapel. Some U.S. Veterans also wear the red poppy and some a white poppy to signify peace.