SUSSEX ASTRONOMY CENTRE

Averted Vision

When you look directly at something, its image falls on your retina's *fovea centralis*. This spot is packed with bright-light-optimized cone cells and provides sharp resolution under strong illumination. But the fovea is fairly blind in dim light. So to see something faint, you have to look slightly away from it. Doing so moves the image of your target off the fovea and onto parts of the retina that have more rod cells, which see only in black and white but are more light-sensitive than the cones.

To see this effect at work, stare straight at a moderately faint star. It will disappear. Avert your gaze just a bit; there it is again.

Practice concentrating your attention on things a little off to one side of where your eye is aimed. This technique is called *averted vision*. You'll be using it almost all the time when deep-sky observing.

As it turns out, your eye is most sensitive to a faint object when that object lies 8° to 16° from the center of vision in the direction of your nose. Almost as good a position is 6° to 12° above your center of view. Avoid placing the object very far on the "ear side" of your center of vision; it may fall on the retina's blind spot there and vanish altogether.

In practice, finding how far to avert your vision is a matter of trial and error. Not enough and you don't get the full benefit; too much and you lose the ability to resolve details.

Your peripheral vision is highly sensitive to motion. Under certain conditions, wiggling the telescope makes a big, dim ghost of a galaxy or nebula pop into view. When the wiggling stops, the object disappears again into the vague uncertainty of the sky background.

But under other conditions, just the opposite technique may work, especially with objects that are both faint and tiny. According to Colorado astronomer Roger N. Clark's 1990 book *Visual Astronomy of the Deep Sky,* some studies indicate that the eye can actually build up an image over time almost like photographic film — *if* the image is held perfectly still. In bright light the eye's integration time, or "exposure time," is only about 1/10 second. But in the dark, claims Clark, it's a different story. A faint image may build up toward visibility for as long as *six seconds* if you can keep it at the same spot on your retina for that long. Doing so is quite contrary to instinct, because in bright light fixating on something tends to make it less visible with time.

Long exposure times might possibly be one reason why an experienced observer sees deep-sky objects that a beginner misses. Perhaps the veteran has learned, unconsciously, when to keep the eye still. It also may help to explain why bodily comfort is so essential for seeing faint objects. Fatigue and muscle strain increase eye motion.