

PSYCHOLOGY

# How To See at Night

## Our Second Kind of Eyes for Night Vision Enable Us To See Our Way in Blackouts and Against Enemy

By MARJORIE VAN DE WATER

See Front Cover

**A**MERICANS are developing a new sight skill—the ability to see the enemy in the dark of night and keep from stubbing toes during blackouts.

We city dwellers who spend all our waking hours in bright illumination may not realize that seeing in night's blackness is very different from seeing by daylight's brilliance.

You have two kinds of sight. One you use in the day and in the artificial sunshine of brightly lighted homes or offices and the white-ways of city streets. The other, only infrequently called to duty, you must use in a dark woods at night, or on the unlighted ocean. Then you must, like the proverbial cat or owl, see in the dark. Only under a full moon, or light of equal brightness, do you ever use both your day and night vision at the same time.

Physiologists know that these two kinds of vision are actually due to two very different kinds of seeing organs in your eyes. In the center of the retina, which is at the back of your eye, are the cone cells. They do your seeing for you in the daylight. Around the edge of the retina are cells of a different shape and different function. These are called rod cells. They see at night. Between these there is an area where both cone and rod cells are located.

### Thousands of Times as Sensitive

Night eyes have severe limitations, but also wonderful possibilities if they are properly trained. They are thousands of times more sensitive than are your daylight eyes.

So important is night vision for airplane spotters, pilots, sentries, and lookouts, as well as for all those who must find their way around in military or civilian blackouts, that the U. S. Navy has appointed a Night Vision Board to teach naval officers how the eyes should be used at night.

The center of your eye is blind at night.

First and perhaps hardest, lesson you must learn about use of your night eyes

is, therefore, to avoid looking straight at what you want to see. What astronomers learned years ago must now be mastered by airplane spotters. Look a little to the right or to the left of what you are trying to observe. Or look a little above or below. If it is faint and you look directly at it, it will disappear like Houdini.

You can even use this as a test to see whether you have been in the dark long enough for your night eyes to be working. Look at a group of stars such as the Pleiades which contains a number of faint stars. First look right at it and count all the stars you can see. Then look a little away and count all you see with the tail of your eyes. If your night eyes are working, you will count more. Look straight at them again and they are gone!

### Night Eyes Are Color Blind

Night eyes are color blind. That is why "all cats look gray at night." If you see a colored light shining at night, and it looks red or green or blue, it is only because it is bright enough so that you can see it with your daylight eyes. But your night vision is much more sensitive to light of some colors than to others. Red is seen equally well by night and day vision. Blue light, however, affects your night eyes 1,000 times as much as it does your day eyes.

Night eyes lack the sharp vision for detail that your day eyes have. If you want to see to read, if you want to watch the dial of an instrument, if you must look at a map, a road sign, or your watch, you must use your day vision. For this you must have good light—the more the better. Especially if the print or other forms that you must see are small, the light must be bright.

Signs or arrows pointing to shelters, intended to be seen in a blackout, should be huge as compared with those intended for daylight eyes to see.

But night eyes are thousands of times as sensitive as your day eyes are.

The night pilot who has been flying in the dark for an hour or more can see the light of a candle or the flare of a match twelve miles away, it has been

estimated, even if it were exposed for only a thousandth of a second.

If it burned continuously, he could see it over 200 miles away, were it not for interference of fog and haze or smoke and the curvature of the earth.

It is very important not to light a cigaret or expose a flashlight during a blackout. Even an instant's flash of light can betray your presence to an enemy miles away in the sky.

Your night eyes can see a light which is only one millionth as bright as the faintest light seen in sunshine.

### Time Needed for Seeing

Night vision is not in use as soon as you step into the dark. It takes time—a half hour or more—before your eyes are dark adapted. When you leave a sunny street to go into a darkened theater, or you step from a brightly lighted room into the dark outdoors, you are completely blind at first.

Then several things happen. The pupil of your eye dilates, letting more light into your eyes. This is a mechanical action like opening your camera diaphragm to take a picture in poor illumination.

Next the cones of your day vision adapt to the darkness. This takes about five minutes and after that you feel more comfortable about moving around in the pitch dark.



**PROTECTION**

*Goggled so that his eyes get accustomed to the dark even though he must be in the light, this Navy aviator, protected by red lenses, can still see enough to get around.*



### NIGHT EYES

*The pupils of the eyes expand (top) to let in more light in darkness, but are normally smaller in daylight.*

After a much longer time, your rod vision adapts to the darkness and you can begin to see shapes and outlines in the night that were not even vague bulking shadows when you first came out.

The air raid warden, the soldier, or the pilot who at the sound of an alert leaves a lighted room to run on duty, is completely at the mercy of his enemy so far as his vision is concerned. By the time he gains the use of his night eyes, the emergency might be all over.

And even when your eyes are dark adapted, flashing on a light, even for a very short time, may ruin your night vision for another half hour.

But there are ways to fool your eyes and have them ready for night duty when the call comes.

If you must read, you can do so with one eye. The eyes can be dark adapted separately. Put a heavy patch over one eye and you can keep it dark adapted while you use the other for reading in the light.

Much better are the red goggles used by the Navy for men on night duty. They wear these when they go into a lighted room, and protect their night eyes from the glare.

Best protection for night vision is darkness. Avoid the use of flashlights or illuminated dials. Turn out the light at least a half hour before you must go on duty in the dark and then protect your eyes from any glare as you value your life.

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blackouts should, if possible, be so selected that they will not spoil the dark adaptation of the eyes that must penetrate the night's blackness in search of the enemy.

Red is generally best for all blackout purposes, the Night Vision Board finds. With red light, adapted eyes haven't the advantage over daylight vision that they have under other colors. For this reason, the red light you read your watch by is seen no more clearly by the enemy pilot in the sky than it is by you, even though you must use light-adapted vision for this purpose. If you had a blue light bright enough for this purpose, it would appear a thousand times brighter than the red light to dark adapted eyes. It could be seen ten times as far away.

Here are some other advantages of red light for the illumination of instruments and for all purposes where some light is essential:

1. The dark adaptation of the observer is disturbed less by red light than by light of any other color.

2. The after image which results from looking at instruments or other surfaces illuminated with red light is much less intense and of shorter duration than when blue, green, or white light is used. If you have been in the dark for a long time and suddenly turn an ordinary flashlight on your watch dial, you may "see" the watch face for some time afterwards and this will interfere with your ability to see the dark form of a plane or a ship.

3. Use of red light for the illumination of instruments causes less glare than when other colors are used.

4. The reflections which are caused by instrument lighting, as for instance on windshields or plateglass, may be strikingly reduced or suppressed completely by the use of red light.

*Science News Letter, June 6, 1942*

### PSYCHOLOGY

## Red Light Best in Blackout Blue Easily Seen From Air

**B**LUE LIGHTS for blackouts are out so far as the U. S. Navy is concerned.

"Blue light is the worst possible for this purpose," reports the Navy's new Night Vision Board.

Lights for use during blackouts must

serve a double purpose. They must give enough illumination so that instruments, charts, or dangerous obstacles can be seen. They must give a minimum of aid to the enemy.

In addition, the lights used during

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