Tips on Buying an FPD TV

Applying what we've discussed…

WARNING!!!

READING OR LISTENING TO THE FOLLOWING MATERIAL MAY CAUSE PERMANENT DAMAGE TO YOUR PRESENT ABILITY TO ENJOY PRACTICALLY ANY IMAGE ON ANY DISPLAY SCREEN. LEARNING THE FOLLOWING GUIDELINES WILL CAUSE YOU TO SEE SOME OF THE SUBTLE DIFFERENCES IN DISPLAYS SO THEY NO LONGER LOOK ALL ALIKE.

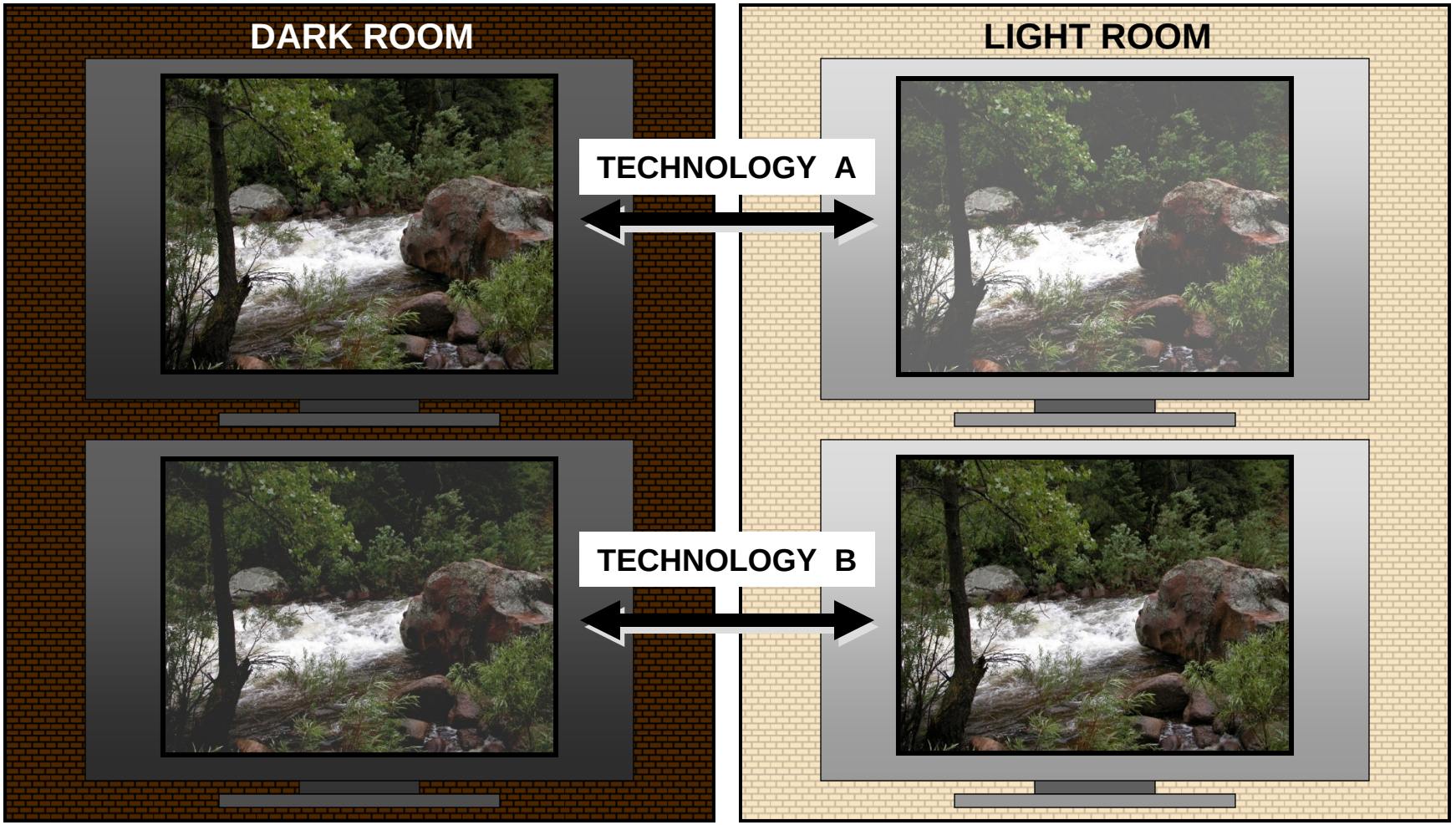
BE CAREFUL! PROCEED AT YOUR OWN RISK!

IF YOU ALREADY HAVE PURCHASED A NEW DISPLAY, ABSORBING THIS MATERIAL MAY NOT BE THE WISEST THING TO DO. YOU HAVE A FEW SECONDS TO LEAVE THE ROOM.

YOU'VE BEEN WARNED!

PROPER AMBIENT

Some displays will perform best in a very dark surround. Some will perform best in a bright surround. Attempt to evaluate the display in the kind of environment into which you intend to place it.



LOOK AT THE BLACKS !!!!!

Most displays exhibit sufficient brightness or you wouldn't consider them in the first place. Often the real test of the display is how it shows its blacks when it is placed in an environment similar to your home. Consider both large-area blacks and small-area blacks. Some displays will show wonderful blacks in a bright environment, but those same blacks will be seen as dark gray when that display is placed in a dark room. Some displays will show wonderful blacks in a dark room, but they can be washed out by reflections in a bright room. Look for shadow detail in the dark regions.

Darkness of small-area and large-area blacks may be important to you. (See next slide.)

Here, the blacks are washed out by reflections from the room.

Here, the blacks bleed a little light in a dark room.

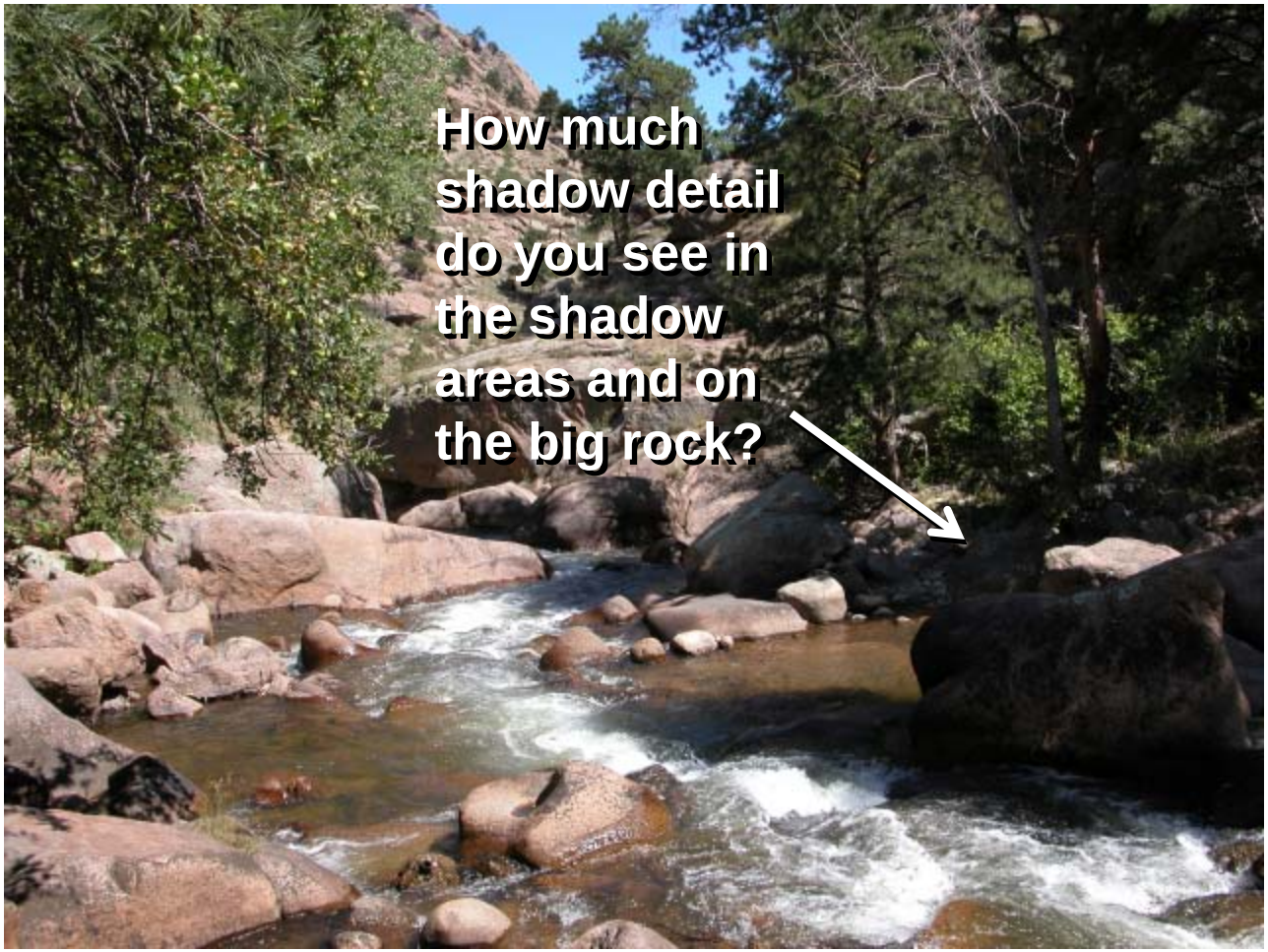
Note that there may be different display modes. Be sure to use the one that works best with quality imagery.

- **LOOK AT THE BLACKS !!!!!**

  Looking for shadow detail in the dark regions…

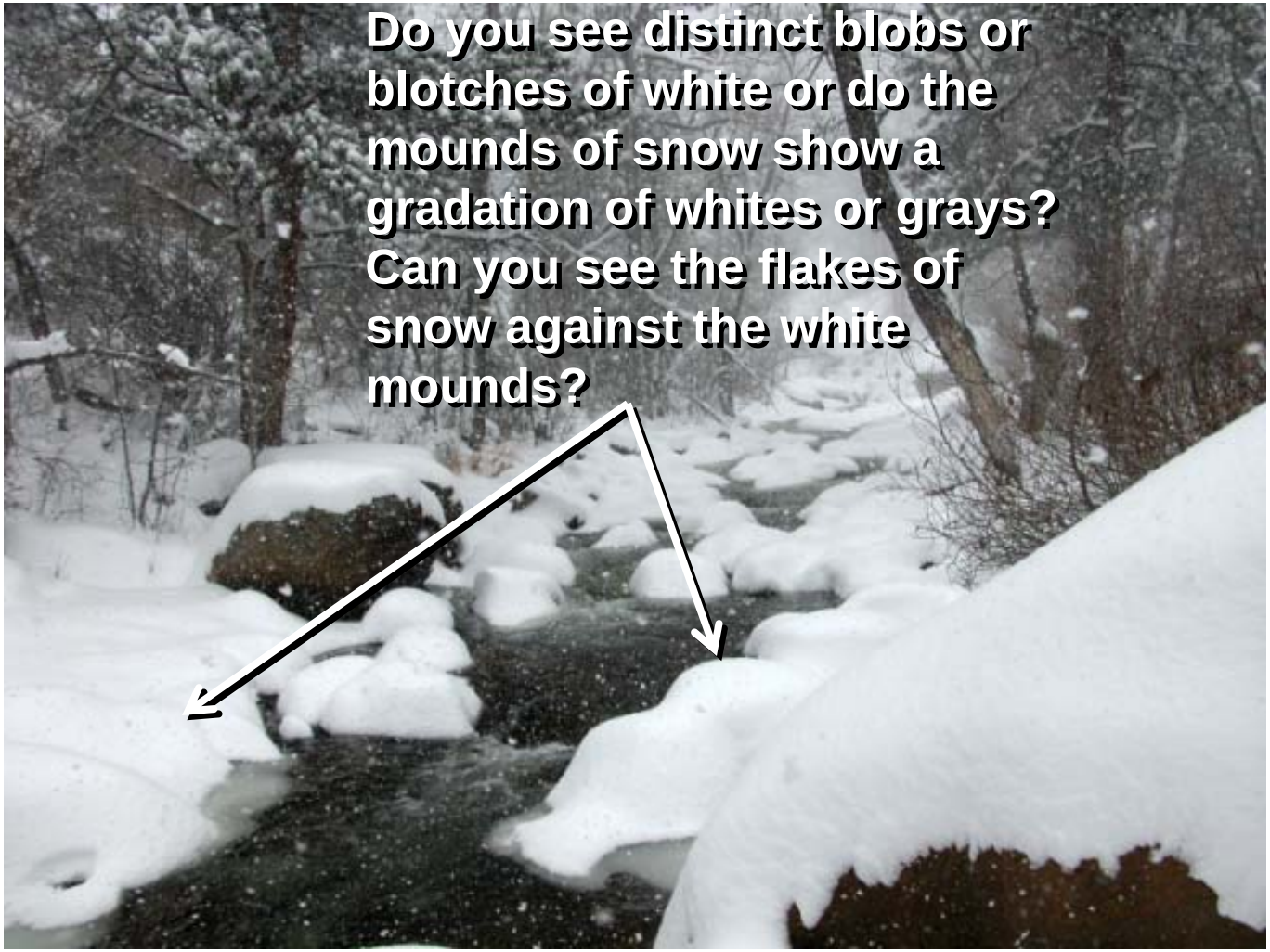
See next slide for full-screen view.

- **LOOK AT THE BLACKS !!!!!**
  Looking for shadow detail in the dark regions…

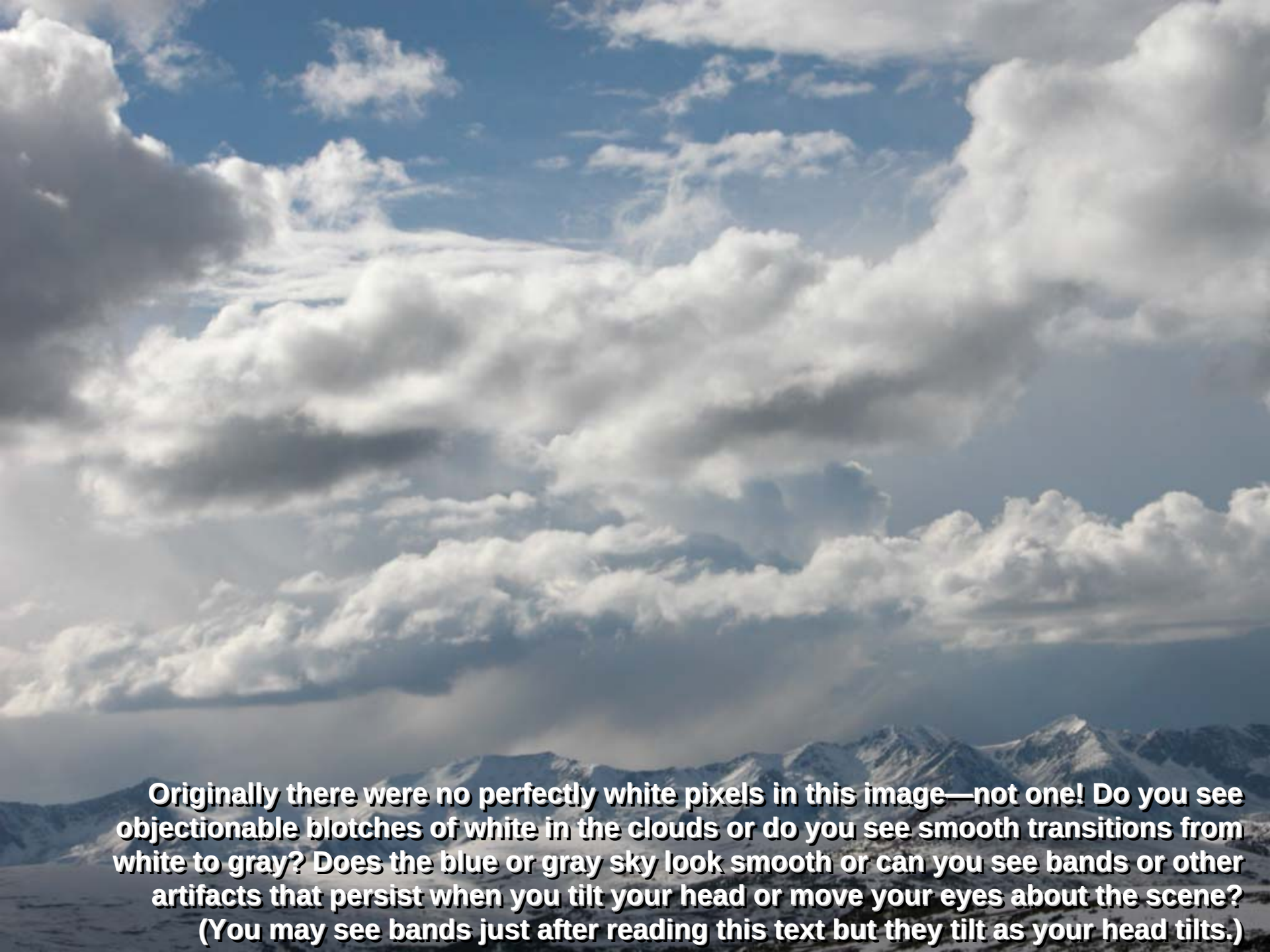


See next slide for full-screen view.

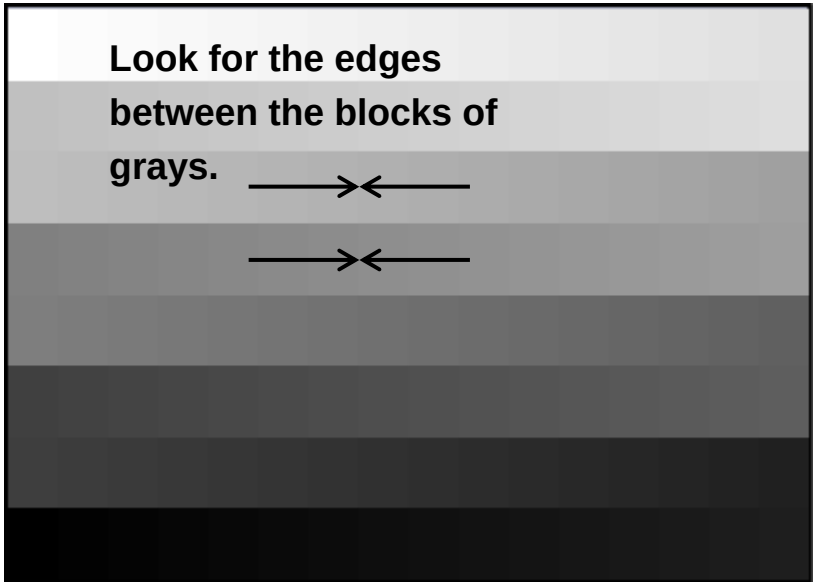
- **LOOK AT THE WHITES !!!!!**
  Looking for detail in the bright regions…



See next slide for full-screen view.


Originally there were no perfectly white pixels in this image—not one! Do you see objectionable blotches of white in the clouds or do you see smooth transitions from white to gray? Does the blue or gray sky look smooth or can you see bands or other artifacts that persist when you tilt your head or move your eyes about the scene? (You may see bands just after reading this text but they tilt as your head tilts.)

- **SHADOW DETAIL AND BRIGHT DETAIL: In a 128-step gray scale, how many of the dark grays are pushed to black? How many of the light grays are pushed to white? There is only one white rectangle (upper left) and one black rectangle (lower left). Because of reflections, the ambient environment you select will especially affect how many of the dark-gray rectangles you will see. This test is often performed in a darkened room. Keep in mind that there may be several kinds of overall performance settings or modes of the display. Some of those settings may reproduce the entire gray scale better than other settings.**



Each rectangle represents a step of two gray levels: 0 (black), 2, 4, 6, 8, … 248, 250, 252, 255 (white; the last step is three gray levels).
— Pattern name SSW128 —

See the next slide for a full-screen view. You may see slight color shifts between gray shades.


128

REFLECTION PROPERTIES

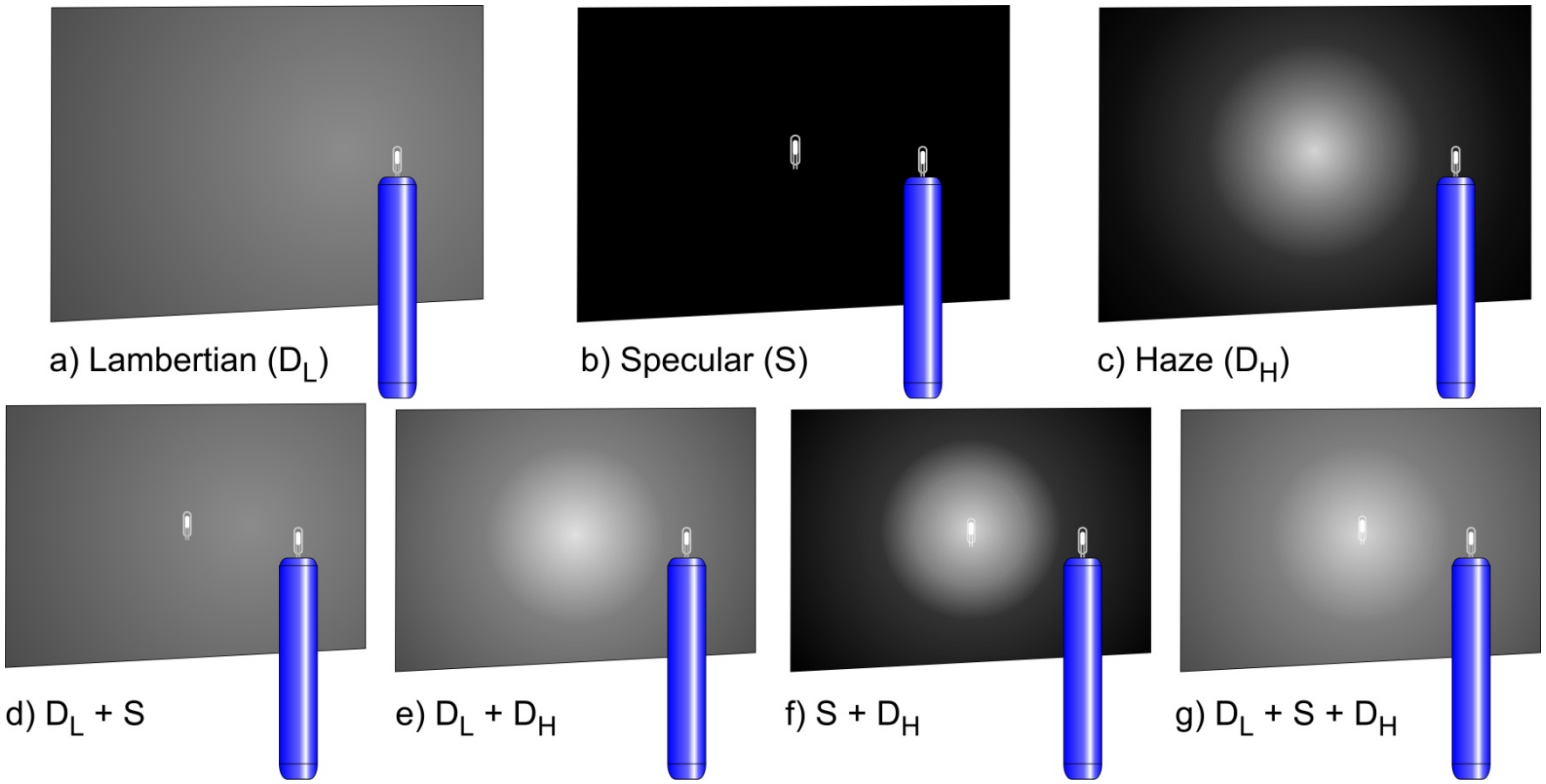
Some displays will reflect light so that you can see the distinct reflected image of the source because they have a strong specular component. Other displays will diffuse the light so that you just see a fuzzy ball of light instead of a distinct image of the source—a strong haze component. How large that fuzzy ball is will depend upon the microstructure of the surface treatment. This diffusing treatment is often called anti-glare or non-glare. Some displays will have both properties as well as a third property called a Lambertian component (like dark-gray matte paint). You will want to keep in mind your living-room lighting and window configuration when you examine candidate displays. Some displays will allow the mirror-like reflections but will reduce them considerably by using an anti-reflection coating. You can often recognize such coatings by the dim magenta, dim blue, or dim green reflections of lights.

PLACEMENT

Some of the problems with reflections can be reduced by placing the display so that you avoid seeing bright objects such as windows or lamps in the reflection off the display surface.

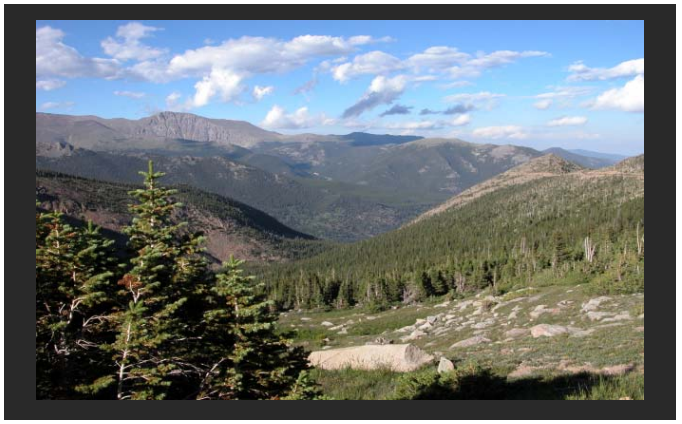
REFLECTION PROPERTY DETERMINATION

Using a flashlight that permits the bare bulb to be exposed (be careful, the bulb is hot!), you can determine the reflection properties using your eye. Lambertian is the background gray color (if present), the specular component produces a distinct image of the source (if present), and the haze component produces a fuzzy ball (if present) instead of the distinct image. The haze component follows the specular component but gets dimmer as you pull the flashlight away from the screen whereas the specular (distinct image) retains its luminance independent of distance (you don't get darker as you move away from a mirror). These components can exist in any combination depending upon the display technology.

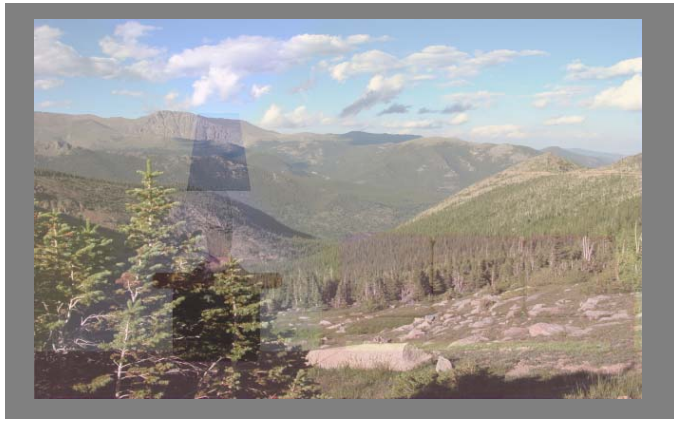


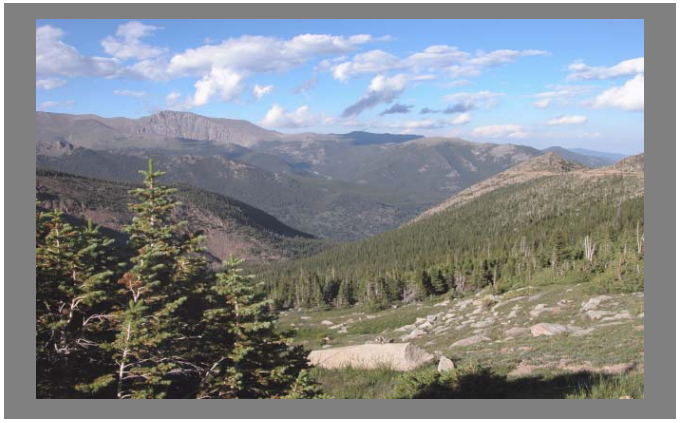
Different Types of Reflections in a Light (Bright) Living Room and the Effects on Image Quality

Darkroom Image



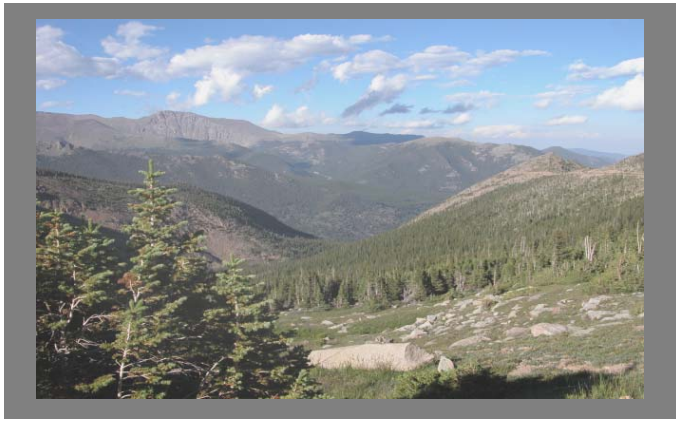
Specular & Lambertian with AR





Haze only, with AR

Specular & Lambertian no AR



Haze only, no AR

AR = anti-reflection surface treatment

SPECIFICATIONS

Unfortunately, specifications claimed for displays cannot always be used to compare them. They may not employ measurement standards properly but use their own methods. Use and trust your eyes. What you see can be exactly what you get. Some displays will exhibit the same luminance when they show a small white area or fill the screen with white. Other displays will show a bright white small area but become much dimmer when displaying full-screen white. So when you evaluate the display, be sure to view a wide variety of scenes.

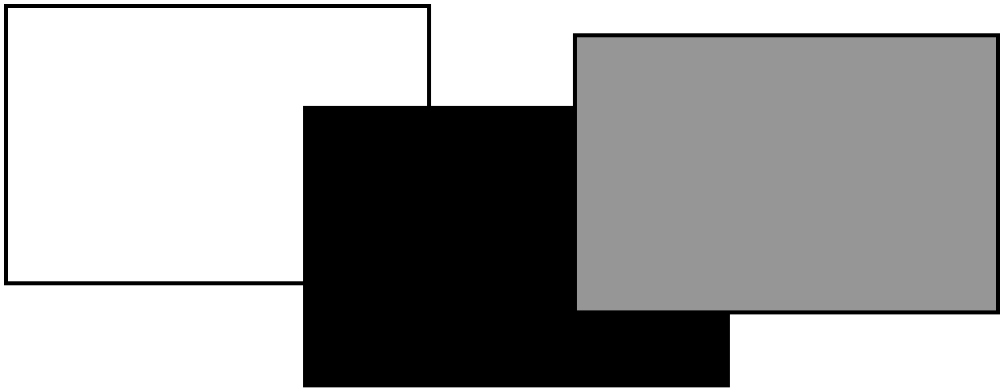
Contrast: 500:1
Luminance: 300 cd/m²

Contrast: 500:1
Luminance: 300 cd/m²

UNIFORMITY

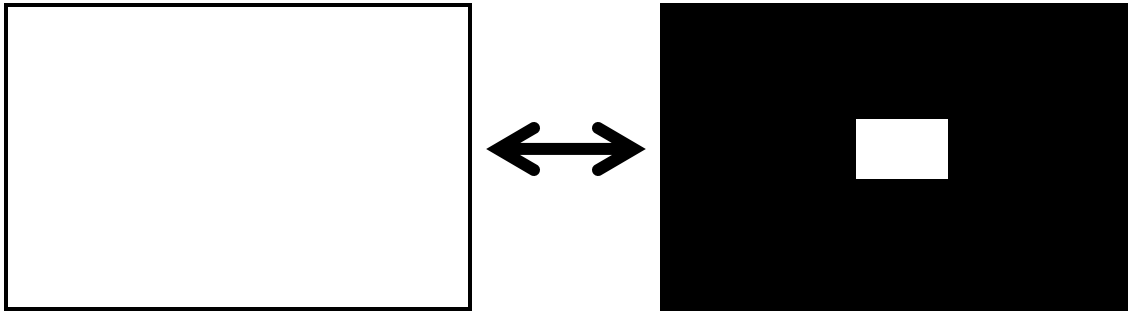
Looking at full-screen white, black, and gray can reveal nonuniformities and pixel defects. Tiled faces can also reveal problems that other patterns don't. The "eye" (the image processing in the brain) is very sensitive to facial detail.

Regarding nonuniformities and pixel defects, what you can or will tolerate depends entirely upon you. A pixel stuck to white might be objectionable particularly in dark scenes, but a pixel stuck to black may not be objectionable even in bright scenes.



SCREEN LOADING

Sometimes the brightness of full-screen white can be much dimmer than a small rectangle of white on a black screen. This is not necessarily a bad thing, but it can affect the specifications that are quoted for comparison.



For such displays, small-area whites can be considerable brighter than full-screen whites. Some consider this an advantage, others don't.

DO YOU SEE OBJECTIONABLE NONUNIFORMITIES OR EVEN PIXELS STUCK TO DARK, BLACK, OR SOME COLOR?

WHITE SCREEN

DOES THIS WHITE RECTANGLE APPEAR MUCH BRIGHTER THAN THE PREVIOUS FULL-SCREEN WHITE?

FLIP BACK AND FORTH BETWEEN THIS PATTERN AND FULL-SCREEN WHITE TO SEE.
(NOTE THAT YOU MAY NEED TO GIVE YOUR EYE A SECOND TO ADAPT WHEN GOING FROM THIS PATTERN TO FULL WHITE.)

BLACK SCREEN WITH SMALL WHITE RECTANGLE (4 % OF SCREEN AREA)

DO YOU SEE OBJECTIONABLE NONUNIFORMITIES OR EVEN PIXELS STUCK TO WHITE, GRAY, OR SOME COLOR?

BLACK SCREEN

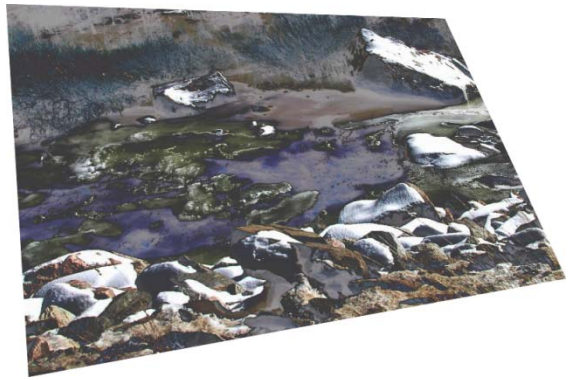
DO YOU SEE OBJECTIONABLE NONUNIFORMITIES OR EVEN STUCK PIXELS?

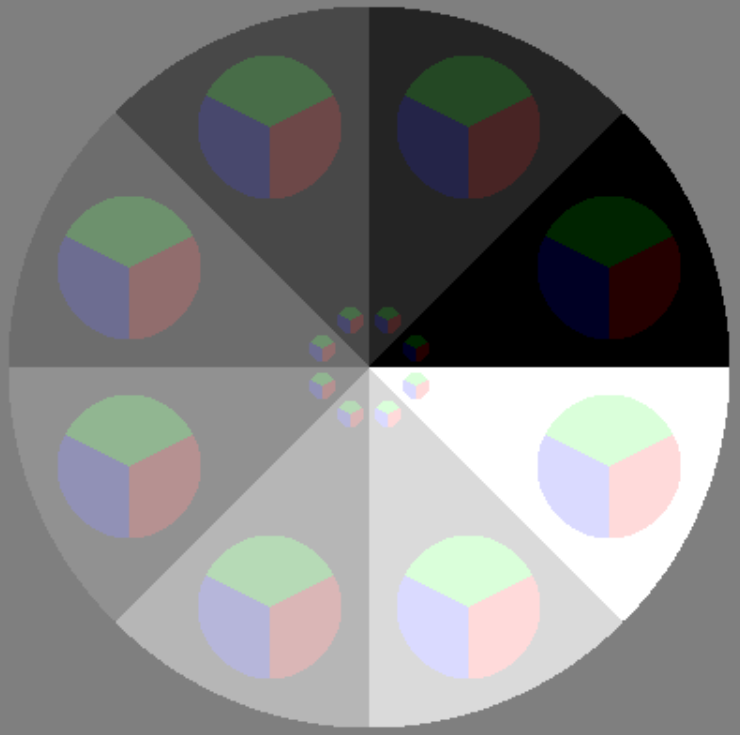
DARK GRAY SCREEN


These computer-generated faces are identical. Do they change …
… as you look around on the screen? (Look at the freckles and highlights.)

VIEWING ANGLE

The problems with viewing angle are gradually being eliminated. However, if you will have kids on the floor looking at the display while you sit on the sofa or if you have a room filled with people viewing the display from all different angles, then the display's viewing angle properties may be important to you. So, check it out. Move around and see what it does with the colors and especially the blacks. Some displays suffer most viewing-angle problems when viewed from the lower right or left. Often static images are useful in such evaluations. Look for contrast reductions as well as color shifts.



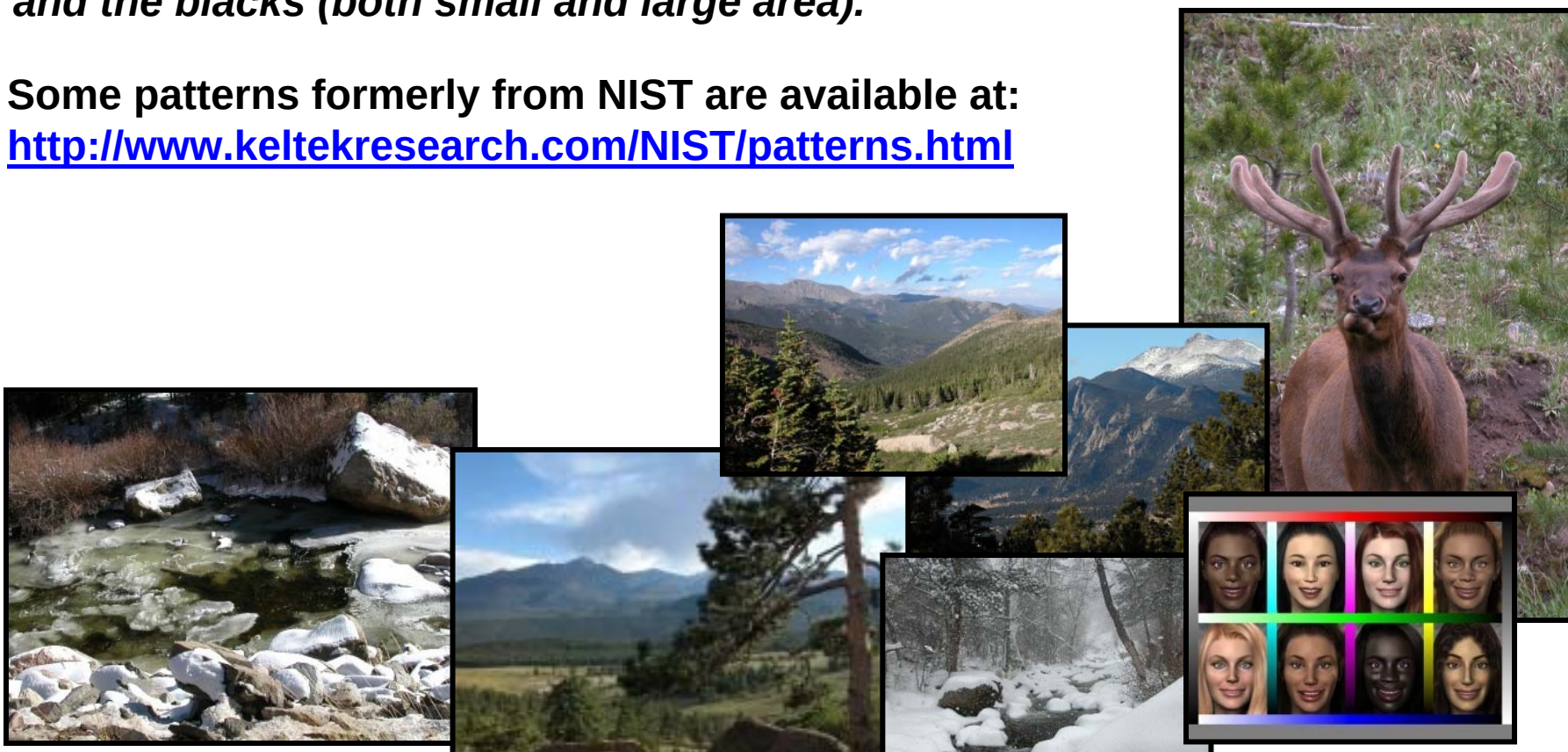


This pattern (Brill-Kelley Pattern) was developed to reveal gray-scale inversions, color inversions, and other color shifts with viewing angle changes.

STATIC IMAGES

Should you be able to view static images on the screen (if the display can be hooked up to a computer), then there are a large variety of images you can use, dark scenes, light scenes, but especially faces. Moving scenes may indicate motion artifacts, but generally don't give you enough time to consider the reflection properties, viewing angle properties, uniformity, loading, the whites (both small and large area), and the blacks (both small and large area).

Some patterns formerly from NIST are available at:
http://www.keltekresearch.com/NIST/patterns.html



Tips on Buying a New FPD, Cont.

PIXEL-BASED IMAGES

There are a number of patterns that are generated specifically for the format you wish to use. We can make available one: 1920x1080 (true high-definition)

Get: NISTDP02_1920x1080.zip

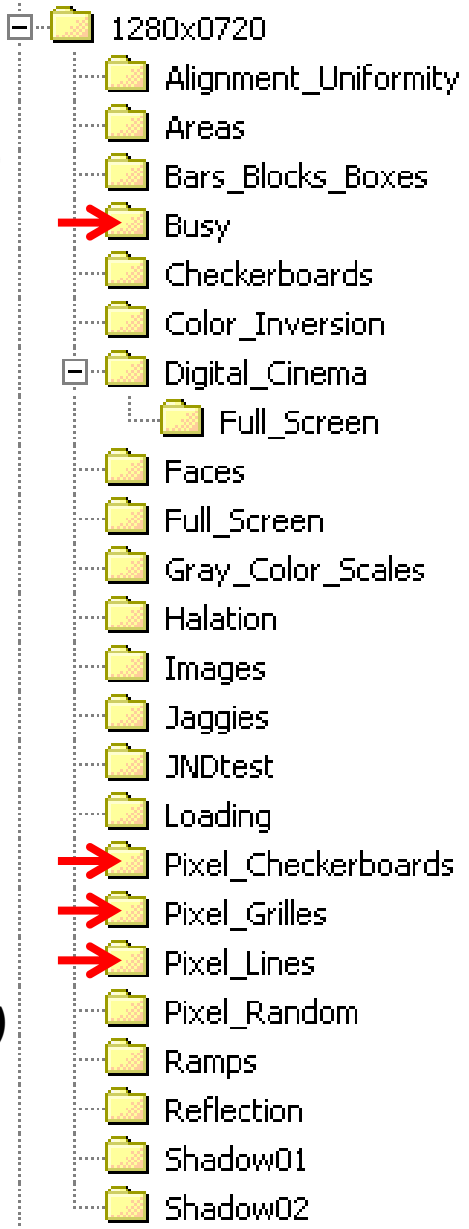
At: http://www.keltekresearch.com/NIST/patterns.html

The folders of particular interest are:

Pixel_Checkerboards
Pixel_Grilles
Pixel_Lines
Busy

Such patterns cannot be properly reproduced in a presentation software like this. The pattern must match the resolution of the display or the resolution being employed by the display.

More patterns are available on the DVD with the printed version of the ICDM documet: IDMS (http://icdm-sid.org/)

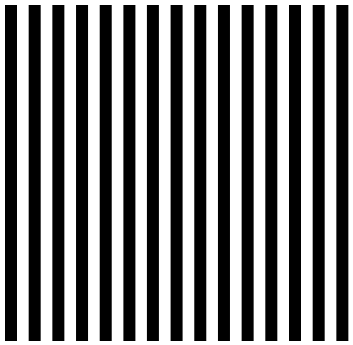


Last slide of Tips.ppt

PIXEL-BASED IMAGES, Cont.

Regarding pixel-based images (also called pixel-specific or pixel-mapped images): Suppose you display a 1x1 vertical grille on the display and do not see distinct white and black lines but rather just a grayish screen. Don't be shocked if it is a television display. That may be done by design to avoid jaggies (see BUSY and Jaggies patterns) and flashing colors with certain clothing on people. Computer monitors should show the grilles and checkerboards distinctly, but that may not be the case for television displays with 1x1 pixel grilles or checkerboards. 2x2 grilles and checkerboards should be visible (but may be softened a little on television displays).

Magnified 1x1 Grille on Computer Monitor



Magnified 1x1 Grille on Television

Enjoy! And thanks for viewing this or visiting our web site.
Ed Kelley