Technologies
Of the
CINECON HCS AND CINEPRO HC SCREENS

Part I Optical Shading
Part II Color Identity Preservation & Resonance
Part III Color Resonance & Resolution

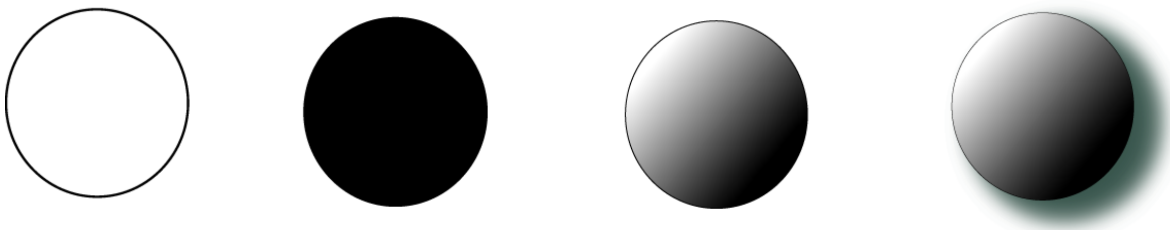
The CINECON HCS and CINEPRO HC screens convey a high definition, enhanced depth look to all images that are projected and focused upon them.

Part I – Optical Shading

Scenes that are collected on a visual recording medium and are comprised of a summation of independent objects. The identity of each object within a scene is defined by its boundary line. The boundary of an object is caricatured by experts as a line of darkness. Some paintings look more three-dimensional than others. This is because some artists are better at handling the boundary line of the object than others. The shading of the object is critical to the artist who is trying to achieve a look to the painting that is more three-dimensional. If the shading is done extremely well, the painting begins to look more and more real.

The phenomenon of shading is best exampled by starting with a pencil and a blank sheet of paper. Draw a circle on the page and notice that it looks flat and two- dimensional. Take the pencil and shade the interior of the circle with light strokes, making it gray or black. With the eraser, adjust the shading so that it is white one edge of the circle and progressively gets darker as you move diagonally across the center to the circle's edge, where it is black. Now the circle that you started with looks more like a ball. By adding a shaded area on the darkest side of the circle you give the appearance of casting a shadow and

therefore add another horizon reference point for the eye to calculate depth and separation between the image and its surroundings. The simple circle has now achieved an apparent three-dimensional quality. (See fig.1)



Graphics showing graduation from simple line drawing to a dimension apparent shaded image

Fig. 1

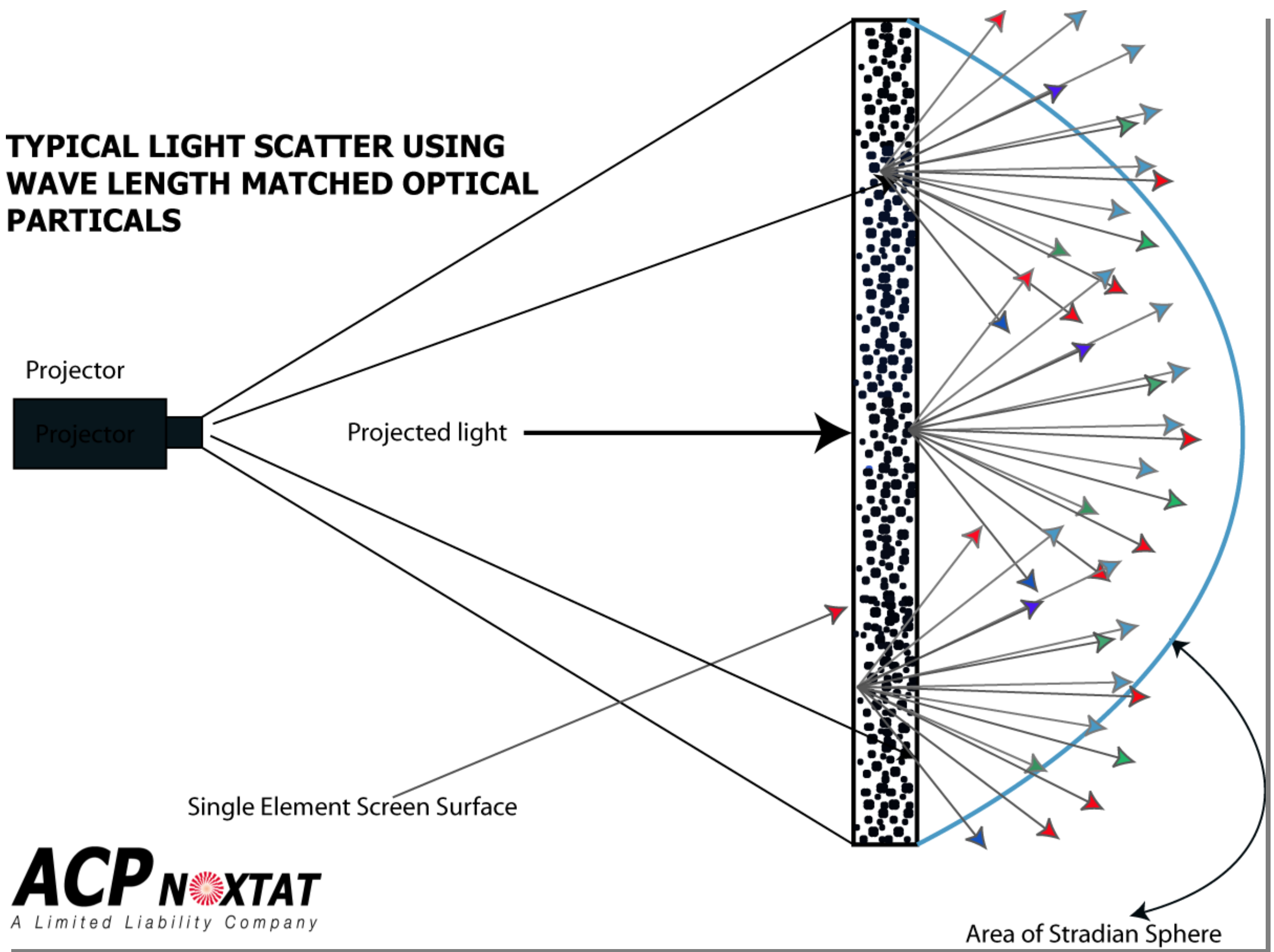
Photography and videography try to achieve this result by increasing contrast, making the blacks blacker and the whites whiter, all the while trying to maintain color balance. Other screen technologies try to reproduce the integrity of the contrast by trying their best to make the whites look white and the blacks look black, and the colors look colorful. High contrast images can look cartoonish.

Current projection technologies increase resolution. Increased resolution does not increase contrast. Increasing contrast digitally does not create the gradual optical shading ratio. This can only be done by mixing the photonic patterns of light.

The CINECON HCS and CINEPRO HC screen systems optically shade the image in a different manner using black levels that are based on the way the shading is achieved in reality when the human eye is observing the landscape of the real world in which we live.

In real life the boundary line of an object is not black. If this were true, black objects would have an apparently different looking boundary than white objects. This is not true. In real life the boundary line is defined by the region of the absence of focused scattering by the object that the boundary line is defining. There is still scattering in that region but it is out of focus. The scattering is by a different object and that object is behind the object whose boundary line is in focus.

The CINECON HCS and CINEPRO HC technology optically packages the information of the boundary line so that it is not a line of darkness but is a line region, which has the apparent absence of scattering. The apparent absence of scattering is achieved by making the scattering along the line have a focal point at an imaginary infinity in the optical space. The technology reorders the light by way of an optical resonant scatterer that contrasts a specific mixture of optical particles invested randomly in a matrix. Those particles then utilize the specific size of the wavelengths of light and the diffraction of that light at different points as the projected light or image passes through the



diffusing layer of the screen. The light is composed of photons that are both particles and waves. Each photon has a state. By mixing those states we can mimic the ordering that is done in real life. The result is that the viewer is presented with the sensation that along the boundary line he can actually see past the object at which he is looking and on which he is focused. This creates apparent depth.

The reason why the apparent depth is created is also psychological. It is well known in perception theory that we see with our brain and not our eye. The eye collects the photons (light) and stimulates the brain. The brain then paints an image in its own subjective psychological visual space. This is the image that we see. The brain has undergone learning and memory. Equivalently there is software in the brain.

Part of that software is the way and means by which we see depth monoscopically. Monoscopic depth as opposed to stereoscopic is the depth that we see with each eye separately. If you put a patch on one eye and look out at the world you can still see depth. The depth is monoscopic.

When the brain sees images on the screen and thinks it can see past the boundary lines, the software of monoscopic depth is activated in the brain. This affects the quality of the image that is painted in the subjective psychological visual space of the brain. The quality of the image that is seen is enhanced.

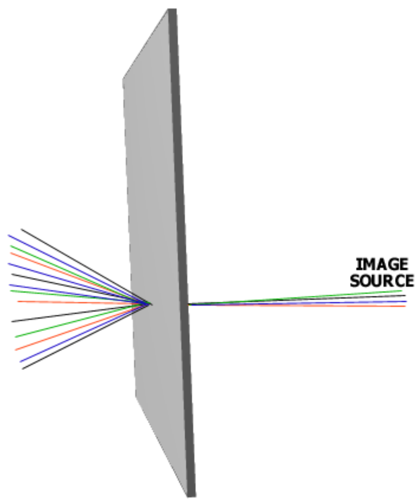
The unique optical shading given to the image, as spoken of, looks more like the optical shading that the brain sees in the real world. This reminds the brain of what it sees in real life thus further activating software that makes it see images that look more real.

The optical shading has another benefit. Since the shading is mimicking the shading of the reality to which the brain is accustomed, it is less work for the brain to watch the screen. The brain does not grow fatigued and there is less eyestrain in watching the screen.

The result is the optical shading of darkness and light is enhanced by the dark matrix of the screen. This optical shading gives rise to an increase in perceived depth.

Part II Resonance, Color Identity Preservation

Visible light is composed of electromagnetic waves of multiple wavelengths between 400 and 700 nanometers (10^{-9}m) (one nanometer is one billionth of a meter). The different wave lengths represent different colors.



We can also think of light as being composed of particles (quanta) with wavelike properties called photons.

Within the screen, there are microstructures, which scatter the photons. Resonant scattering of a photon or scattering resonance occurs when the photon comes into contact with a microstructure whose dimensions and optical response characteristics match the wavelength of the particular photon. Resonant scattering results in a scattered wave whose amplitude is maximum above the optical noise. This preserves the color or identity of each photon.

Within the screen, there is a dense distribution of optical resonant scatterers. Imagine that a red photon enters the screen. It will encounter many scatterers but will only scatter resonantly off resonant scatterers for red photons. Now imagine that a yellow photon enters the screen. It will only resonantly scatter off those scatterers that have resonant dimensions for yellow photons.

The resonant scatterers for yellow and red photons are located at different physical positions within the screen. When red and yellow light waves are projected onto the screen, the red photons and the yellow photons scatter and emanate from different physical positions in the screen. The color identity of these photons has not been lost by the screen, thus there is not a mixing or washing of the colors by the screen.

The eye does the mixing of colors. The color identity of each photon is preserved by the screen. The mixing of the red and yellow photons by the eye gives rise to a perceived orange color. The color orange is distinct and defined.

Projecting the red and yellow photons onto a conventional screen, the mixing is done by the screen. The color orange perceived appears to be more of a milky orange. Thus, through piecewise resonant scattering of the different color photons from different scattering sites in the screen, maximum color identity preservation is achieved, giving rise to a richer texture of color in the image.

Part III Color Resonance and Resolution

When images are projected onto a screen, the resolution of the screen needs to be greater than the projector. Otherwise, the image quality is reduced by the screen. The proposed CINECON HCS and CINEPRO HC screens actually enhance the resolution by virtue of the screen's color resonance.

Imagine that a single square dot of blue light of a single wavelength is projected onto the screen. The dot has a cross sectional area of one square millimeter. Within that area of the screen, there are many scatterers that resonantly scatter the blue photons. The regions of the screen which do not have resonant scatterers for the blue light still scatter. The scattering however, is not as strong. The resonantly scattered blue light is brighter. Thus, the single dot of blue light is restructured into many blue dots by the resonant microscattering structure. Yet each of the new smaller dots has its own identity since it is emanating from a unique position within the screen.

The result, to a human eye, is that there has been an apparent increase in resolution. Even though no new information has been created, the existing information has been restructured. If one takes a video and projects it onto the screen with 325 lines of resolution, the picture looks like 525 lines of resolution or more. The effect is a passive high definition look. The screen thus enhances the resolution of the image.