

In my estimation, seeing, representing, and expressing the black-and-white scale of a scene is the single most important skill a painter or a photographer can possess. This skill, when applied with experience and mastery, is the key element in creating presence in a work of art, and presence is the cornerstone of all masterpieces.

Presence as the key to masterful artworks has a history that spans the practice of art since Leonardo da Vinci popularized the technique of *chiaroscuro*, a skill borrowed from Flemish manuscript painting. *Chiaroscuro* is the modulation of highlight and shadow and the attendant color saturation (what we today call shading). It immediately caused a sensation; shadows and highlights looked more real and colors more vivid than before. *Chiaroscuro* achieved a sense of volume in modeling three-dimensional objects that painters were unable to create before. The technique brought artists closer to creating what they saw and felt in a subject, changing painting forever.

The invention of the camera obscura enabled painters such as Johannes Vermeer to create paintings with even more astonishing realism. The camera obscura, a dark box with a hole or lens in one end that projected an image of the scene on the opposite wall of the box, enabled artists to draw an outline of their subject and make a more accurate painting from it. Artists frequently added “corrections” or little touches here and there, however, because the projected image didn’t seem exactly real for some unknown and perhaps intuitive reason. After the invention of photography in 1839, the camera replaced painting as the “pencil of nature” as William Henry Fox-Talbot, one of photography’s inventors, called it. Painters, feeling appropriated and maligned by the new technology, went on to expand their medium to forms such as Impressionism, Cubism, Abstract Expressionism, and more current derivations.

Behind all the inventions, techniques, and movements in painting and photography lies a fundamental truth about the inherent degree of visual perception involved in each: What the painter represents on canvas is a representation of what is visually perceived, while what the photographer represents in an unaltered image is only what is actually seen, not what it visually perceived. What is seen by the retina of your eye or the sensor of your digital camera represents a quantity of light as it falls on a subject or scene. This quantity of light is known as luminance. Luminance combines both the surface reflective nature of the scene being photographed as well as the illumination falling on the scene. What is visually perceived (and painted by a painter) is a many faceted neural operation that separates reflection and illumination and combines them with edge definition, depth, form, and wholeness—a process that, for the artist, is inherently more “real” than what we take for realism in a photograph.

The irony of this situation is that photography was invented to depict reality, but some might argue that a great representational painting is more real than a photograph because it takes human perception into account rather than just the raw act of seeing. Great photographers in history have often expressed their intuitive sense of this discrepancy between seeing and perceiving. These masters sought to manipulate the image to correspond to their perception of reality rather than take what is given to them by the camera. This effort by the great masters of the medium of photography to go from seeing to perceiving is manifested by the strong presence in their prints.

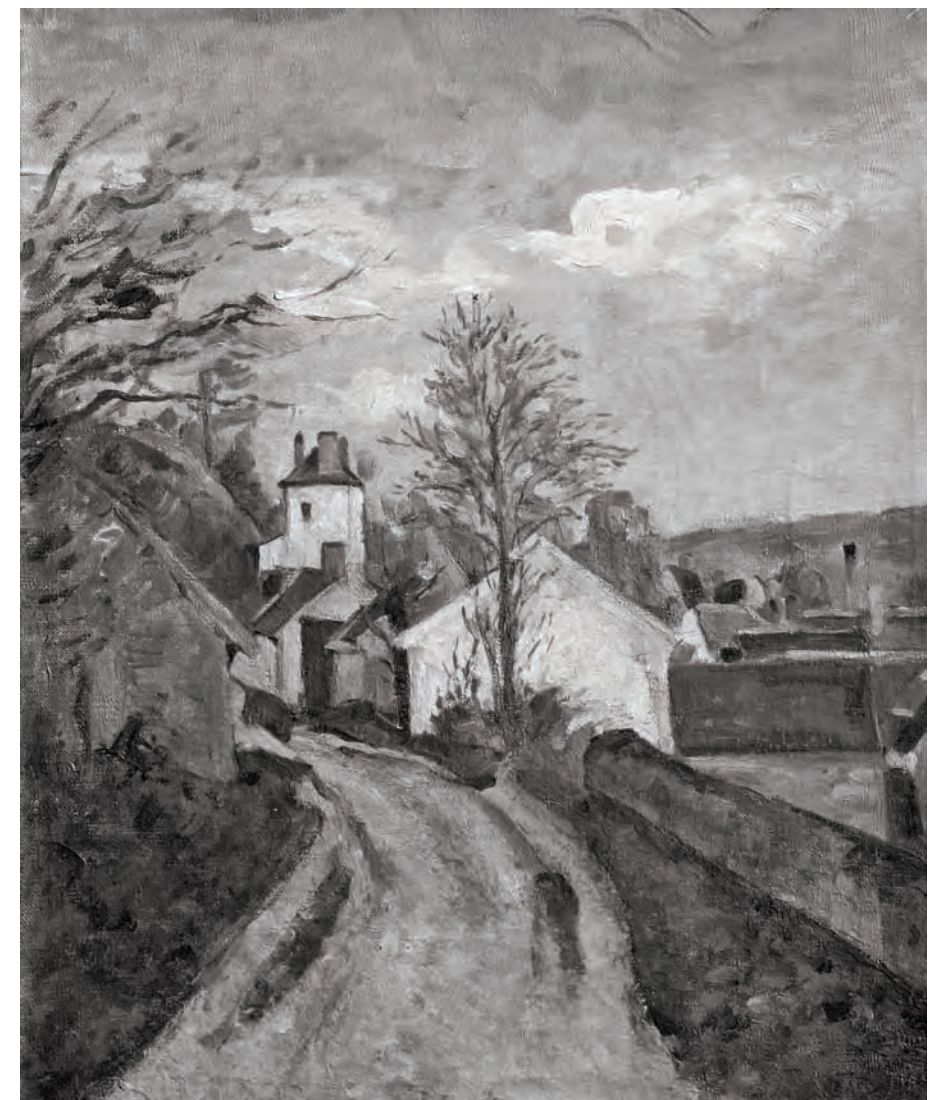
Exploring Tonal Values

Many years ago, I was searching for a way to intrinsically understand the compositional structure of Paul Cézanne’s still life and landscape works. After weeding through several large format books, it occurred to me to photocopy the pages in black and white to eliminate any color and see the bare compositional structure. What I saw, even in those days of really bad copy machines, was a hint at not only the structure, but (and most importantly for us here) the beauty of the grayscale image underlying the color. I was astonished at the textured highlight values, the full shadow areas, and the clear separation of the midtone grays. I can remember being soberly impressed by the skill of this great artist and his manipulation of the grayscale alone. The thing is, he did it without any reference to tonal values. This seemed to me even more of a miracle. How could he perceive the value scale from the color and make it so beautiful?

When the computer age arrived for photographers in the early 1990s and adobe pioneered its Photoshop software, I used the program to digitally convert the images of the great master painters into grayscale and further study their intriguing mastery of tonal values. Over the past 12 years, I have downloaded and converted thousands of these great masters’ paintings, I have not found one, from da Vinci to Pollack that did not exhibit an outstanding grayscale in both the grouping of values and in the separation of those values. The masterful articulation of the grayscale in these paintings is not only the key to good color, but also the essential key to creating presence in the work—the foundational element of a masterpiece.



Cezanne, Paul (1839-1906)
The house of Dr. Gachet at
Auvers, c.1873. Musée
d'Orsay, Paris France Photo
Credit: Erich Lessing / Art
Resource, NY



Looking at black-and-white images of great master paintings is, for me, a feast for the eyes and a continual learning experience. It is the ultimate expression of how grayscale can be manipulated, much more so than is achieved in the traditional black-and-white print (although black-and-white silver printing was mastered by some—Paul Strand, Ansel Adams, Minor White, Edward Weston, W. Eugene Smith, Paul Caponigro, and a handful of others who represent the epitome of this craft). Only a few photographers have achieved this mastery of grayscale, and I have always wondered why.



Duerer, Albrecht (1471-1528). Hare. Watercolor, 1502. Graphische Sammlung Albertina, Vienne, Austria Photo Credit: Erich Lessing / Art Resource, NY



Renoir, Auguste. Madame Henriot, c.1876. Gift of the Adele R. Levy Fund, Inc. Image courtesy of the Board of Trustees, National Gallery of Art, Washington.



Monet, Claude (1840-1926). Vetheuil, Setting Sun. Oil on Canvas. Photo: H. Lewandowski. Musee d'Orsay, Paris France Photo Credit: Erich Lessing / Art Resource, NY



In 1978, Dr. Edwin Land published his “Chairman’s Letter” in the Polaroid Annual Report. This powerful, yet little known writing, lays out the reasons for the profound difference between the master photographer and the ordinary one. Here is an encapsulation of that essay:

The most extraordinary of man’s artifacts in the reconstruction of reality is the black and white image comprising, of course, a series of grays. It can be shown that in seeing color, objects are separated out from each other by the preferential efficiency of the surface of one object or another for reflecting light of one wavelength or another and that this preferentially remains intact irrespective of the variation in time and place of the illumination on the object from the world around it. Black and white photography generates, as it were, a substitute world: light of the same wavelength composition comes to the eye from any part of the scene. This preferentially for reflecting at different wavelengths (colors) is absent and cannot be used to designate objects. Rather only the difference from object to object in the efficiency for reflecting a uniform mixture of wavelengths can be used.

Here comes the miracle. The enormous variations in illumination of the objects by the world around them have led to enormous variations

in the amount of light reaching one object or another in a random way, so that portions of the photograph delineating dark objects may send to the eye more light than portions of the photograph delineating white objects. In short, the photograph is two entirely different kinds of report transmitted to us by what appear to be mixed languages, the language for delineating objects and the language for displaying illumination.

There have not been many great photographers in history, but the great ones usually turn out to be masters of the vocabulary of these two utterly different languages in black and white photography. For most would-be photographers these languages are mixed together and never disentangle, like the babble of voices at a cocktail party. The breathtaking competence of the great photographer is to cause the object of his choice to be revealed with symphonic grandeur, meticulous in detail, majestic in illumination.

~Dr. Edwin Land~

That passage has haunted me for thirty years. It is the sole (I almost wrote soul) reason behind this book. To understand what Edwin Land was talking about, you have to understand his interests. Although he considered himself primarily a research scientist, he was Chairman of the Board, Chief Executive Officer, and Director of Research for Polaroid Corporation. He was one of the richest men in America, with a net worth of over \$500,000,000 and he had over 500 patents. His interests in research carried him from the invention of Polaroid film materials, to the first instant cameras, to the Retinex Theory of Color Vision, to black-and-white peel-apart large format film. Of primary interest to us here is his research with lightness perception and his decades long association with Ansel Adams.

The substance of the Land essay highlights the subject of a photographic masterpiece and the overall process by which one is made. As Land so eloquently puts it in what, in my estimation, are the key passages of the essay, “the photograph is two entirely different kinds of report transmitted to us by what appear to be mixed languages, the language for delineating objects and the language for displaying illumination.” He then goes on to note that, “There have not been many great photographers in history, but the great ones usually turn out to be masters of the vocabulary of these two utterly different languages in black and white photography. For most would-be photographers these languages are mixed together and never disentangle, like the babble of voices at a cocktail party. The breathtaking competence of the great photographer is to cause the object of his choice to be revealed with symphonic grandeur, meticulous in detail, majestic in illumination.”

From Luminance to Luminosity

The camera and the retina see the same luminance in an image, which is a combination of reflection (in the words of Land, “the language for delineating objects”) and illumination (“the language for displaying illumination”). The visual cortex in the rear of the brain processes this luminance signal from the retina, separates reflection and illumination, and recombines them in a very special way to show us the world as it truly is, visually. The brain first detects edges, separating those edges into illumination edges and reflection edges. Then, it uses complicated algorithms to process the image into our perception of luminance, called luminosity or brightness. This is an important point, and bears repeating: Be mindful of the difference between actual luminance and our perception of luminance, called luminosity. An unprocessed image direct from the camera is a straight luminance image, hence the disparity between what we visually perceive and what we get in a photograph.

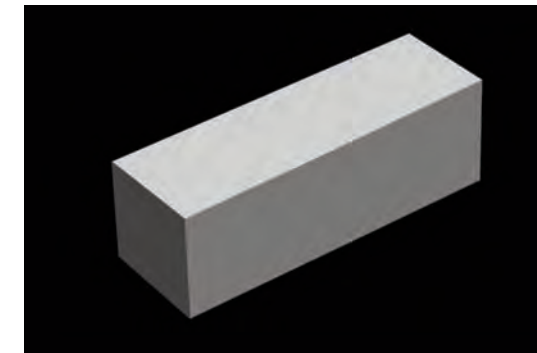
What painters have been able to do since the invention of chiaroscuro (see page XXX) is to “fool” the observer’s eye by taking a straight luminance image and adding elements of visual perception to the canvas to create that artist’s subjective interpretation of luminosity. So, painters are involved in a secondary process that most photographers don’t ever go through, except, as Land hints, in the greatest masterpieces, which have been dodged and burned extensively (a form of secondary processing that, when done well, mimics this secondary step that painters employ).

John Sexton, a contemporary master printer in traditional black-and-white silver photography, uses a very complicated burning and dodging procedure that mimics what the painters do to a canvas. The black-and-white photography masters (such as Ansel Adams, Minor White, and Gene Smith) also burned and dodged in very complicated

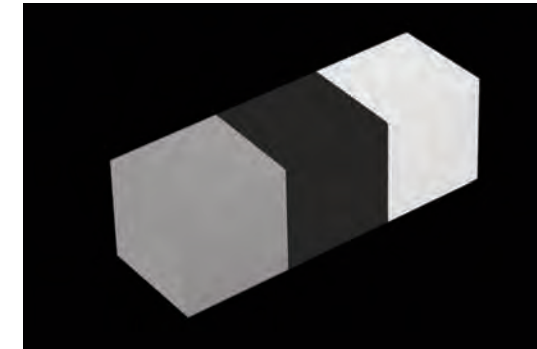
ways. Someone once asked Gene Smith how he made a print and he replied, “I go into the darkroom in the morning with a gallon of Dektol in one hand, a package of 11x14 Polycontrast J under my arm, and a fifth of scotch in the other hand, and come out twelve hours later with a print.”

Great photographers are able to transform the raw luminance of the captured image into something that expresses their own unique perception of the world. Learning this skill of transforming luminance into luminosity takes time and practice. In terms of our discussion, changing luminance into luminosity is creating what lightness perception scientists call “good constancy.” We, as artists and photographers, recognize that as presence. Visually, here’s how the luminance problem (the “gaggle of voices”) presents itself:

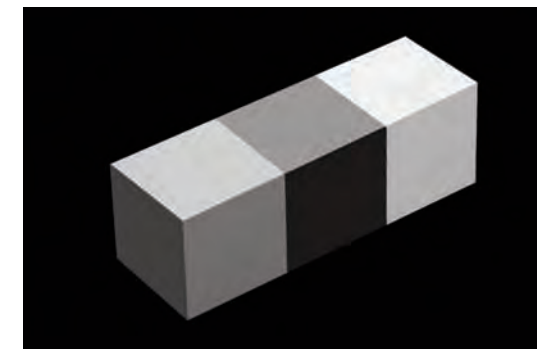
In looking at these images (right), you can see how the reflection image and the illumination image combine into luminance. The result looks startlingly lifelike until you compare it to the luminosity image. This set of images illustrates the difference between what we think is real (the image direct from the camera) and the image as it is processed through visual perception. This is the difference between luminance and luminosity, respectively. What we get from the camera needs that secondary processing step for it to look like what we visually perceive and feel. The following image sets are some real photographic examples of this process.



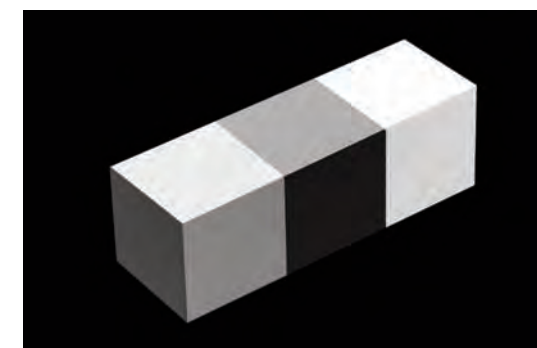
Reflection



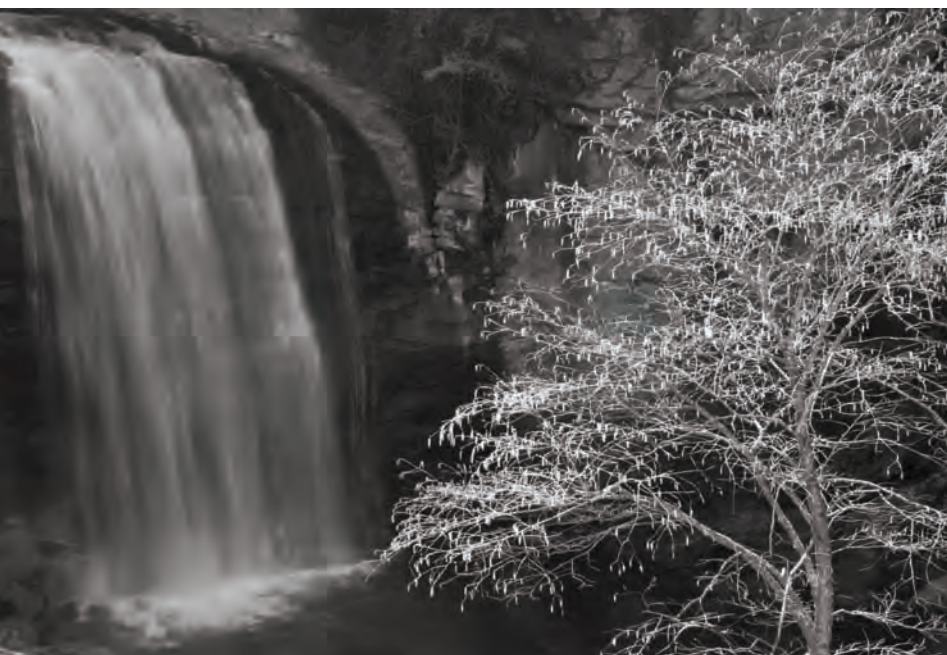
Illumination



Luminance



Luminosity



Luminance

The first image in each set is a RAW file converted to black and white in Adobe Lightroom software using the grayscale button in the Develop Module. These initial grayscale images are otherwise unprocessed, and they represent a basic luminance image. The second image in each set was converted in Adobe Photoshop using the PercepTool plugin. The differences you see in each pair will depend upon the inherent depth and tonal spread each has to begin with. For this reason, the effect of the PercepTool plugin is more pronounced in some of the luminosity transformations.



Luminosity

Here, the major change from the luminance image is the separation of the bright tree in the foreground of the luminosity image. While parts of the background need to be lightened for an ideal presentation of the scene, the major effect of the PercepTool plugin is to separate depth boundaries, as shown clearly in the luminosity image.



Luminance



Luminosity

In this image set, we see that the flat luminance image is enhanced by the articulation of the grayscale and framework grouping capabilities of the PercepTool plugin applied to the luminosity image. The luminosity image also shows definite depth boundary enhancement from the well lit foreground to the background.

The separation of the trees from the background was paramount in this image, and the depth boundary enhancements and articulation enabled by PercepTool aid in this immensely.



Luminance



Luminosity



Luminance

There are many depth boundaries in this image and the PercepTool did a great job at enhancing them. The corrected luminosity image may seem darker in the shadows, but remember that the effect is a perceptual one, and a print would show all the detail in the lower gray areas.



Luminance

While the effect of the PercepTool on this image seems slight (the only real change being overall contrast enhancement), notice that the luminance image looks flat against the rock whereas the luminosity image is much more three dimensional. The PercepTool combines differential contrast and edge effects to obtain this marvelous sense of being there.



Luminosity



Luminosity

What are depth boundaries?

Our eyes communicate information about depth to the brain through identification of depth boundaries in the world around us. To illustrate this, hold up a hand in front of you. Now place your other hand directly behind it so they are touching. Using depth perception, our eyes recognize that one hand is closer than the other. The depth boundary is the place where the two hands meet—the point at which the depth changes.



Luminance



Luminosity

The PercepTool effect on the egg is startling. It seems to jump right off the page due to the increased modeling and edge definition.



Luminance



Luminosity

Here, the luminosity image shows another incredible transformation. The number of edge enhancements, framework, and tonal articulation details are too numerous to count.

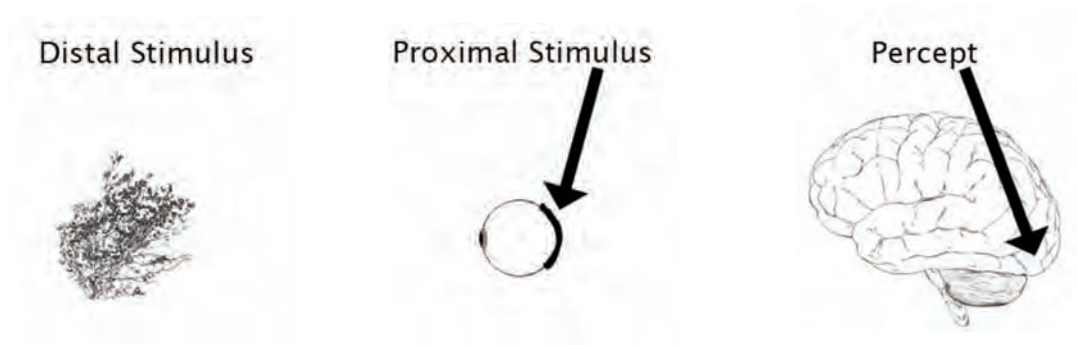


Luminance

Even in a landscape with little depth like this one, the PercepTool plugin finds the boundaries. Look how the central gray cloud advances forward and the mountain in the rear appears more distant in the luminosity image because of the edge enhancement and articulation of the tonal values.



Luminosity



Perceptual Processing

So far, I have said little about black-and-white printing. However, the information included here is the groundwork necessary to understand and solve the deepest and most profound mystery of art itself: “How do we represent what we see?” This is the domain of a little known science: the science of lightness perception.

I will not use these pages to recount the full history, research, and practice of lightness perception (a task which others have done so well, most notably Alan Gilchrist in his book *Seeing Black and White*). The fact remains that we still do not know everything about visual perception, and much needs to be discovered before machines can see like humans, which is the goal of the lightness perception community. Painters figured this all out intuitively over 500 years ago, and science has been slow to follow. That said, what I would like to share with you in this book is a method for practicing artistic black-and-white inkjet printing that is inspired both by the intuitive sense of lightness perception achieved long ago by the great masters and the scientific interpretation of lightness perception today.

Science is interested in what is called veridical, or truthful, correspondence from a real object to the perception of that object. As artists and photographers, we are interested in making an image—be it on canvas or paper—look and feel like a true representation of our perception of the subject matter. In order for us to understand how to make a black-and-white inkjet print into a masterpiece, we need to look briefly at the basics of perceptual processing. Otherwise, we are completely at the mercy of technology and the endless parade of equipment we neither understand nor enjoy.

The perceptual process begins with an object or environment outside of the human visual system, called the distal stimulus. The distal stimulus sends luminance values to the lens of the eye, which projects that luminance onto the retina; this projected luminance is called the proximal stimulus. The retina then sends the luminance signals via the optic nerve and the lateral geniculate nucleus to the visual cortex in the rear of the brain where luminance is processed into the image we see. This processed image is called the percept. Note that the retina, just like the camera, sees only the luminance image, not the one perceived after processing by the visual cortex (see diagram, XXX).

The functions of the eye and the retina are well known to the scientific community, but the understanding the visual processing of luminance as it passes from the retina to the visual cortex is still a work in progress. The following is a simple explanation of how the luminance image is transformed during perceptual encoding according to the latest science on the subject. (I will update this information periodically on my website at www.georgedewolfe.com.)

Frameworks

Frameworks are a key recent development in the understanding of how the perceptual process works. Introduced by the Gestalt psychologist Lajos Kardos in 1934 in his book *Ding und Schatten* (Object and Shadow) and expanded and refined by Alan Gilchrist in 2006 in his book *Seeing Black and White*, a framework is a group of surfaces that belong together, like the highlights, midtones, and shadows of a black-and-white image. The overall picture is referred to as a global framework, and it contains all the other local frameworks within. A local framework is composed of tonal values like highlights or overlapping (occluding) depth boundaries (see the sidebar on page XXX for details). The visual cortex processes the image from the retina something like this:

1. The visual cortex finds the edges in the luminance image and separates those edges into two categories: reflected edges and illuminated edges. (Remember that luminance is a combination of the surface reflective nature of the scene being photographed as the illumination falling on that scene.)

2. The image is then spatially processed to create a perception of depth (called scale normalization).

3. Based on edge and depth classification, the tonal values are filled in to complete frameworks (highlights, midtones, and shadows). In each framework, the image is anchored to the highest value within it. The strength of a framework depends on three factors:

Size — This relates to the size of the framework relative to the other frameworks in the image. The larger the framework, the greater its relevance in the image.

Articulation — This is the number of distinct black and white tonal values in the framework. The greater the articulation, the stronger the image.

Grouping factors — Grouping factors are the visual grouping principles of edges, patterns, and the similarity and proximity of tonal values to one another. Anything that groups in a local framework strengthens the overall image.

4. The final percept (luminosity) image is created by adding the illumination image (perceived directly by the retina and separated at the beginning of the process) back into the mix.

This gives us some insight into Dr. Edwin Land’s two types of visual report (illumination and reflection—see page XXX) and shows how they are separated in the visual cortex, grouped into frameworks based on edges, depth, and tonal values, and then consolidated by anchoring local and global values to create the perceptual image that we see and that, as photographers, we must learn to recreate in our images to produce presence. In the next chapter, we will take these concepts and apply them to digital photography to discover how to do just that.

Qualities of a Black-and-White Photograph

chapter | two

The fundamental error in what both the sensor of a camera and the retina of the eye see is that it is not what is perceived in the brain as visually real. In the last chapter, we explored this through examining this process through the lens of current lightness perception science and through the way in which painters solve the problem intuitively. Now it's time to focus on how photographers can address this issue.

In order to find out what we need to correct in a photographic image to create a print that reflects what we perceive as visually real, we need to understand the qualities of that image as they relate to our visual perception and the technical tools at hand. We have two essential problems to solve:

1. We need to see like the camera sees in order to capture an accurate two-dimensional luminance image. Remember that the camera sees like the eye's retina, but the brain doesn't "see" that same image, so we have to train ourselves firstly to see what the camera/retina sees.
2. Next, we need to manipulate the luminance image to conform to our perception of the subject or scene, thereby creating luminosity. In other words, we want to change the image we captured in-camera into something that looks like the world the way our brain organizes and interprets it.



The positive shapes are the roots; the shadows represent the negative space.



This is the very simplest example of negative space. The chair is the shape and the wall is the negative space.



Here, the pinnacles are representing the positive shape of the image and the sky is the negative space that surrounds them.

Seeing Like a Camera

In order to take a good photograph, we first have to see two-dimensional space, the space of the retina and camera sensor. It is a flat world, very different from the one we perceive. The easiest way I know to learn to see two-dimensional space is through the art of drawing.

Now that everyone has had a chance to cringe, relax. Drawing is actually a skill that is easily learned in a week—at least well enough for our purposes of learning how to see in two dimensions, that is. I taught drawing for seven years to beginning photographers and I can tell you that everyone who did the exercises learned the skill needed to see like the camera sees. Many were angry and uncooperative at first about the prospect of learning drawing, but after the first few lessons, everyone learned the skill and went on to translate their newfound ability to photography. There is a structured and fail proof way to accomplish this.

Almost thirty years ago now, Betty Edwards wrote a book called *Drawing on the Right Side of the Brain*. The methodology in this book changed the way people learned to draw. Instead of teaching a technical drawing skill, Betty teaches drawing as a perceptual skill, so anyone with a normal perceptual apparatus can learn drawing. The reason Betty was so successful is that she realized that drawing is the direct result of seeing, not pushing a pencil. And the same is true for photography; it is the result of seeing, not of manipulating a lot of technical equipment.

I suggest you pick up a copy of Edwards' book, along with the accompanying workbook (*The New Drawing on the Right Side of the Brain Workbook*). Read the book and work through the exercises at your own pace. It will be one of the best things you do for your photography in your lifetime. I do some of the negative space exercises included there as a routine part of my advanced mentoring program. Even if you only worked through the exercises in negative space, you'd be

light years ahead of those who have never explored this way of seeing. I have literally seen photographer's images change in less than a week because of this training.

The secret to seeing two-dimensional space is to see only the results of what light does to a subject or an environment. Light creates tones of black and white in the subject, and these tones create shapes and spaces. What we have to do is train ourselves to see just the spaces, and shapes formed by them, in order to see the two-dimensional image the camera will photograph. Drawing on the Right Side of the Brain teaches this skill. Edwards suggests the use of a frame to practice seeing negative spaces. Photographers have used blank slide mounts and cutout cards for years to aid in this process, a practice she recommends highly in her book. If you want to get started learning shapes and spaces right away, here is an easy shortcut:

1. Take a small piece of clear packing tape, smear a very thin coat of petroleum jelly on it, then attach it to the viewfinder of your camera. The world should look fuzzy, but you should still be able to discern major spaces and shapes.

2. Go out and take 50 – 100 photographs with the tape on the viewfinder, paying attention only to the major shapes and spaces you see.

3. Convert the images to black-and-white using an image-processing software such as Lightroom or Photoshop. Look at the images on the computer and notice how important those shapes and spaces are to the image. The detail you could not see in the viewfinder is now visible, but it is organized by the shapes and spaces. This is not as good a learning tool as drawing spaces and shapes, but many of you will be able to pick up the skill doing this instead because it is a natural thing for photographers to learn.

You must learn to see this way every time you photograph if you want to see the two-dimensional luminance image that the camera sees. It is the first step towards making a good photograph, it is essential for making any image with presence, and it is manifestly important for creating a masterpiece. It is a door though which you must pass.



Jack's head and shoulders make up the shape and the wall makes the negative space.



Here, the spaces and shapes are almost equal, but the white leaves still show more definitively as the shapes.



In this example, the spaces and shapes are almost indistinguishable from one another. There are competing shapes and spaces in both the sky and in the mill.



This middle range gray image still shows good separation of shapes due to slight changes in tonal value and overlapping (occluding) edges.



I use this #1 B&W viewing filter from Tiffen to help me see the world in grayscale the way a camera would.



This is the color of the Kodak Wratten 90 filter from which the Tiffen #1 B&W viewing filter is made.



Here is the same scene viewed through the B&W viewing filter.



To observe the effects of the B&W viewing filter, first take a look at this original color image.



This is what the image looks like after I applied a black-and-white conversion in Lightroom.



By looking through this filter at the scene in front of you (with your eye—don't put it on the camera), you can see tonal merges, low or high contrast, and well separated middle values. This ability to see in black-and-white before you click the shutter button is essential for anyone wishing to photograph and produce black-and-white prints. The Tiffen #1 B&W viewing filter aids this practice considerably.

Most photographers tend to photograph “things” rather than the shapes and spaces that make up those things. The camera does not differentiate between a person's face and the shapes and spaces that make it up. We are the ones who label our subjects. The camera has no idea of anything but spatial attributes. I call this “the content problem.”

I can tell instantly if a student is “content oriented” or “image oriented.” These pages show some examples from one of my advanced mentoring students.

Ansel Adams once said that great excitement for a subject often veils a clear image of it. He was speaking of “the content problem.” The content of your image can be your worst enemy when you're trying to represent the world in a photograph. Learn the skill of recognizing negative and positive space and free yourself from the shackles of the subject.



Here, we see an entirely different story. The same photographer went back to the same spot a week later with instructions to look only at the negative space, and her photographs improved tremendously. She almost instantly weaned herself from the typical content oriented photograph.

These two images illustrate content oriented seeing. Notice the haphazard arrangement of the negative space and the vision centered on the subject. (Images © Beate Sass)

Transforming the Luminance Image

Transforming the luminance image from the camera into something that resembles what we saw and felt in reality is, and always will be, to me, a miracle. Over the centuries, artists have labored to reproduce the presence that exists in the world in their work, and their greatest attempts are recognized as masterpieces. What I have learned from studying the work of great master of painters is that their grayscales are the most important aspect of their paintings (see pages XXX – XXX). The grayscale not only creates the presence, but also lays the foundation for the color overlay. While these artists weren't actually working in grayscale, they intuitively knew the importance of tonal value.

By transforming the work of these masters into black and white, I study their grayscales as though I have found a map to some long buried treasure. I search for three basic things: tonal values, the way the tones are organized, and how the tones are bound at their edges to create depth and separation. Each artist is different, and each has a distinct gray signature. This is how we should look at a grayscale photograph: We need to delineate its tonal scale, its tonal structure, and how depth and separation are created by the edges.

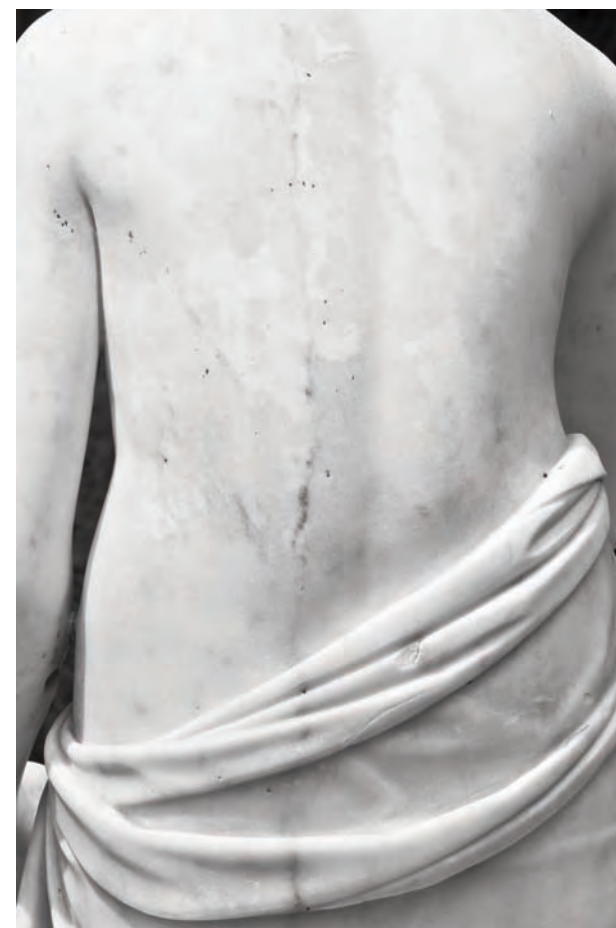
Tonal Scale

The tonal scale refers to the number of black, white, and gray tones in the image and how they are distributed. For instance, there may be a predominance of gray tonal values, indicating a midscale oriented mage; a greater number of high tonal values (closer to white) means that an image is high key; a greater number of low tonal values (closer to black) denotes an image as being low key. These, of course, are not the only designations; there can be infinite combinations.

A recognizable pattern in the tonal scale in a photographer's images indicates a sophisticated level of seeing. Often, this pattern can be roughly discerned by looking at histograms of the images. If in examining histograms of several images by one artist, a discernable trend is observed, it reveals a real maturity in vision. The histograms of the black-and-white conversions of the French Impressionist painter Pissaro, for example, show remarkable consistency in their distribution of tonal values. Ansel Adams is known for his fabulous array of tonal values, from complete black to complete white. Roy DeCarava is famous for his low key photographs of African Americans.



This image is very low key. The values actually go only to middle gray at the horizon and not white. The eye anchors on the highest value in the global framework of the image, creating an illusion in which the brain “sees” that highest value as white.



Notice how the values in this high key image go from about middle gray to white (not counting the black background), with good separation of values in between.



A good middle key photograph is based on very good separation of tonal values. Otherwise it looks too “muddy,” like this one does. If you practice working with middle gray images, you’ll get really good at seeing and separating those midtone values—the greatest challenge to overcome for beginning printers. The problem is fixable, but you have to be able to see it first.



Here is the same middle key image optimized for midtone contrast. I adjusted only the midtone values, and the adjustments really make the image pop.



Here is another middle key image with good separation of tonal values. The great Impressionist painter Claude Monet relished in being able to see how subtly he could make his midtone grays without them all blending together. Take a look at his work in black and white sometime.

Tonal Structure

The structure of tones in a grayscale image is composed of frameworks, patterns, or groups of tones. Tonal values are separated in the brain into highlight, midtone, and shadow frameworks. This is one way of looking at the tonal structure of a photograph. Another way is to identify tonal values by the patterns they make in the picture, a so-called “web of light” that acts to bind the image together. The structure of the tonal values in these ways and others enables us to better enhance black-and-white articulation and create presence.

Edges

Depth in a photograph is formed by edges (illuminance or reflectance edges—see definitions in the glossary, which starts on page XXX). These edges are distributed roughly into near, middle, and far distance frameworks. The visual reconstruction process in the perceiving brain starts with finding edges. The luminance image from the retina is presented to the visual cortex, then it gets torn apart (into illuminance and reflectance intrinsic images) and reassembled into the image we “see.” Once the image is torn apart, it is quickly and systematically analyzed into a skeleton of edges (groupings) based on whether these edges are illumination edges or reflectance edges. These edges form groups of planes based on the arrangement and number of illumination and reflectance edges relative to one another. For instance, a flat wall is only one plane and would generally be represented by a reflectance edge and look flat to us. A landscape of mountains would have three dimensional planes consisting of both types of edges.



There is no depth in this photograph. All you are seeing is the effect of reflection edges and tonal value.



Here, you can see the overlapping (occluding) edges of light against dark that separate the image into planes of depth. As you look farther into the distance, notice how the edges become softer, an indication of them being farther away from us.

The process in the brain’s visual cortex then fills in the edges with normalized reflectance values (a process where our brain compresses all of the reflectance values toward middle gray) and then the illumination image is added back into the mix. Tonal groups are formed into highlights, midtones, and shadows (there is still theoretical debate as to whether the image is composed of a shadow/highlight groups or shadow/midtone/highlight groups). Contrast enhancement (sharpening) is applied according to each group, the highlights and midtones receiving the most and shadows the least. Depth is assigned to edges based on whether that edge is an illuminance or reflectance edge and grouped into near, middle, and background depth frameworks. The tonal values are then anchored to the lightest value in each framework (highlights, midtones, or shadows). All of this happens, literally, in the blink of an eye.

The explanation of how this process of transforming the luminance image into luminosity occurs is a work in progress. As new discoveries in lightness perception are unveiled, our view of the process changes. However, the general facts are now known, and we should proceed as artists in using this recent research to create our masterpieces.

Here, then, after considering all we’ve discussed so far, is a breakdown of the qualities we need to address to make an excellent black-and-white print into a masterpiece, and the specific general tools we need to use to adjust those qualities. Based on what we know today, we need to create multifaceted edge/depth effects, and tonal value articulation to create presence.

Edges and Depth

Edges are hard, soft, or somewhere in between. This may sound like I’m stating the obvious, but it is truly very involved. Most of us think of global sharpness in an image as the holy grail of quality. We also tend to think of sharpness in terms of planes of focus as photographers. For example, a background may be blurred, or not.

The truth is that edge definition is local not global in nature. Our perceptual apparatus makes objects in shadow less defined than in the highlights and the midtones. So, if you make all objects in the image equally sharp, the image does not read as perceptually true. And, of course, just as great images are not globally sharp, they are not globally soft (blurry). Sharpness and softness tend to be related to important areas like the highlights and the midtones, but an edge also has to account for depth as well as definition. For example, objects, like the front brim of a hat, should be sharp, but the back of the hat should be soft.

A camera does not see horizontal depth from highlight to shadow, near to far; it only sees in one vertical plane of sharpest focus, with everything else less being sharp on either side. If you want to represent an image as the brain sees it, you have to represent sharpness and softness on a local level, not a global one. Painters have known this for 500 years. James Bama, the great American western painter, once told me on a personal visit to his ranch in Wyoming, “It’s all about edges, George. It’s all about edges.” (See page XXX for an example of Bama’s work.) Sharp edges in an image represent nearness and soft edges represent planes that are farther away. Sharpness creates definition and separation, while softness creates blurred detail and blending.



In this version of the portrait, I have only applied global adjustments in Lightroom.



Look carefully at the edges in this rendition of the portrait and compare them with the image above. I have increased the softness of most of the edges that are farther away and sharpened the edges in the foreground. The effect is subtle, but effective. I also applied Adobe Lightroom’s LightFlow tool (called the PercepTool in the latest version). You can clearly see the difference between the luminance image above and this luminosity image.

This is a really good example of a hard-edged foreground and a misty soft background.



In addition to differential local edge sharpness, the brain translates depth with a number of different cues. The most important of these is overlap, or occlusion, where one object breaks the outline of another, thus making it appear in front of the object behind it. These occlusion boundaries, as they are called, are part of the mix that help the brain create depth from the luminance image it gets from the eye in order to create the luminosity image. Other depth cues are available, but overlap and differential local edge sharpness are the most important. Many will argue that an effect like receding atmospheric haze is another depth indicator, but its effect is nothing more than an image to which many soft local edges and low contrast have been applied. Look back at the image of the Buddhist tablets on page XXX for a good example of many of the ideas presented here. For that image, however, everything was sharp because it was a relatively flat plane with lots of edges and detail.

This image is an excellent example of receding sharpness and overlap causing depth. The foreground, middle ground, and background are clearly separated by overlapping edges, and the image gets softer as you look into the distance. This was a classic technique of the Hudson River School painters in the 19th Century.



Manipulating Tonal Values

Tonal values are the heart of a great masterpiece regardless of its depth. The photograph may be completely flat with no depth at all, but have a multitude of black, white, and gray tones. This articulation of tonal values represents what we saw and felt in the original scene and is the single greatest factor that creates presence in an image. As illustrated in the last chapter, this is both a centuries old artistic truth and a scientific fact.

The tonal values in a photograph are made up of spaces and shapes that represent different degrees of brightness from black to white, separated by edges. It is important to accept that this is all an image is composed of. Everything you do to a black-and-white image revolves around manipulating these values and their edges. Our only controls over this manipulation are brightness, contrast, and sharpness (including softness or blur).

You must gain complete mastery over these three simple controls. You must learn every thing about them. You must master all three instruments as if your very life depended upon them if there is to be any presence in your work.

Brightness

The term brightness as we use it in Lightroom and Photoshop has the same meaning as luminance as used in lightness perception science. It is a casual word that has crept its way into the glossary of photographers over many years. Lightroom has a Brightness slider under the Basic tab in the Develop module. It becomes a bit more confusing when we go down to the HSL sliders in the Develop module—Hue, Saturation, and Luminance. You might expect the word lightness to be used here instead of luminance, but actually, luminance is the correct term and has the same meaning as it does in lightness perception terminology. In truth, the Brightness slider in the Basic tab has the same function as the Luminance slider down below in the HSL slider group, so don't hesitate to use either slider for a brightness adjustment.

For all intents and purposes, the word brightness as used in the Lightroom and Photoshop equals luminance. Now that we've cleared that up, making adjustments to luminance (aka brightness) is very simple. If a photograph, or part of it, is too light or too dark, use these adjustment tools to make it right. Saying part of an image is "too" light or dark is, of course, relative, not absolute. Increasing brightness affects the entire image (or the area selected) with the same amount of light, and shadows and highlights are increased or decreased by the same amount.



In this rendition, the porridge is too light.



Now, it's too dark.



This porridge is just right.

Contrast

Brightness and contrast are not the same thing. Contrast adjustments affect each tonal value differently rather than affecting them all similarly as brightness adjustments do. Photographers and painters often have a tough time seeing the difference in these two concepts. Contrast is simply the difference in value between the highest tone in the image (or an area of the image) and the lowest tone.

An area of high contrast looks as though the high values are too high and the dark areas are too dark. A low contrast (or flat) image is one where the high values don't look high enough and the low values look too high. The separation of values is a key concept in the adjustment of contrast. Good separation shows the tonal values as clear and distinct, whereas bad separation shows little distinction between values, often causing the image to appear "muddy."

This image has normal contrast with a beautiful range of tones. Only local adjustments were needed.



Here, the subject looks totally flat.



To fix the contrast issues in the image at left, I applied an increase of global contrast as well as local contrast enhancements and edge definition.



This image clearly needs a boost in contrast, but going overboard with the contrast enhancement would make the scene look too stark and lose its mood.



I applied a very slight global contrast increase to bring out the mood rather than detract from it.

This image required little manipulation other than midtone separation and enhancement. The scene looked a little flat through the B&W viewer (see page XXX), so I knew I was going to have to increase the contrast slightly in the final image.



Anyone who has been to Antelope Canyon can attest to the extreme contrast of the place, but I came prepared to tackle the problem. For each image I took, I bracketed seven f/stops in one stop increments and combined the exposures in Photoshop using Optipix software into the one image that you see here. The image needs a lot more work, but combining the exposures in this way did give me a fairly decent image to work from that is (mostly) not clipped in the highlight and shadow areas. (You can also combine exposures to accomplish this technique using 32-bit HDR Merge software. See page XXX for more information.)



Eureka Dunes is a beautiful, often mystical place. This image was high key, yet the tones were well separated, so all I had to do was convert the color image to grayscale in Lightroom to achieve this look. It is absolutely marvelous to see hanging on the wall. Sometimes you really do get lucky.

Sharpness and Softness

The sharpening I want to deal with here is not the type of sharpening digital photographers talk about. The sharpening and softening of an image the way the brain perceives it is vastly different than the global image sharpening and final print sharpening that digital photographers employ. The brain not only sharpens edges differentially in the highlights, midtones, and shadows (applying more sharpness in the highlights and less in the shadows), it uses alternate softening and sharpening to create depth along depth edge boundaries. This kind of sharpness is local, not global. There are several dimensions to consider.

Hard and Soft: Some objects are hard-edged and others soft-edged. A ball or a cylinder is, by its visible nature, “soft.” A box or a book is visually “hard.” And there are all sorts of objects in between. Human anatomy, for instance, tends to be hard in places where bones show, and soft where only muscles or fat are present underneath the skin.

Space: A sense of space can be created in even the smallest dimension by adding the softness of “spatial air” between and among objects. One of the best examples of this kind of art is represented in the paintings of Walter Tandy Murch. Spatial atmosphere is created by soft edges and low contrast. The image on page XXX `xxF2.23.tif` is a perfect example of this.

Near and Far: The nearest object to us in a photograph should have the sharpest edges, while one farther away should be soft. A person’s ear in a head and shoulder portrait, for instance, should be softer than the frontal plane of the face and eyes because it is farther away. The difference here should be subtle, not overwhelming. See the portrait on page XXX `xxF2.21bxx` for an example of this.

Overlap: Overlap is created by edge contrast more than hardness or softness. One typical technique is to outline an object so that it appears to be in front of another. The edge itself can be soft or hard; it is the outlining that separates objects by creating contrast. The Buddhist tablets on page XXX are a good example of this.

All of these effects can be created using local controls in Lightroom and Photoshop to manipulate the luminance image into becoming the luminosity that our brain perceives in the world. Accomplishing these effects takes time, practice, and keen visual awareness. Applied successfully, these effects bring a photograph to life and create presence.

PercepTool

I invented PercepTool to solve many of the problems mentioned in this chapter. Basically, the tool works with the luminance image we get from the camera and corrects it to look like the luminosity percept produced by the visual cortex of the brain. The idea behind PercepTool originated in 1978 with Ed Land’s essay (see page XXX) and continues with my ongoing research in lightness perception. At this point it is nearly impossible to create this percept effect manually in Photoshop. So, I set out to make a Photoshop plugin that would accomplish this difficult task with the most sophisticated tools available to us in digital imaging science. In the action and software, one click changes the luminance image into the luminosity percept of the visual cortex. For those of you making that one click, remember that the development time and research involved behind that click took 30 years. It is available in both action and plugin forms on my website: www.georgedewolfe.com.



Here is an original image without any adjustments applied.



Here is the same image after applying the PercepTool action.

Manual Controls

The PercepTool accomplishes the major task of creating an image that we actually experience in the world, but artists and photographers always want to fuss over their images. In this section, I’ll describe specific ways of working with both global and local controls in Lightroom and Photoshop that help enhance the image using a consistent workflow. The local techniques lighten and darken local shapes and spaces, assist in creating overlap, depth boundaries, near/far relationships, and others. The techniques outlined here especially allow for differentiating gray values in each of the tonal frameworks.

“Tonerobics”

Minor White, the great 20th Century black-and-white photographer, was my mentor for two years when I was teaching at the New England School of Photography in the early 1970s. I learned many valuable things about photography and its practice from him, and one of the most valuable was the tone exercise he used to give students. Basically, we made sets of gray, white, and black patches in the enlarger, each with a just barely perceptible difference from one another. Beginning printers usually only made about 25 – 30 tones, but advanced printers made

upwards of 55 – 60. At the time, I made 48. I had been in photography for about 10 years. The discrepancy between how many tones a beginner can make and how many an experienced printer makes always intrigued me. It's not the ability to make the print itself that's hard. It's seeing the differences between and among very closely spaced tonal values. Lightness perception refers to this as articulation. In this book, I've defined this hard-earned skill as the ability to create presence.

Over the 30 or so years since Minor's death, I have carried on a more sophisticated program of what I call Tonerobics—learning

the perceptual skill of seeing presence. It's sort of like playing scales on a piano, but with visual black and white tones instead. To access the image files you will need for these exercises, visit my website to download them for free (www.georgedewolfe.com).

By the time you finish these exercises you will understand intuitively that there is a visual vocabulary of tone that exists in the image and is created by the action of light alone, independent of the subject. You will also have a sound knowledge of how to create those tones at will with whatever technique you choose. Working with these

“scales” and “arpeggios” is as necessary for mastering black-and-white printing as learning actual scales and arpeggios is to mastering music.

Dealing with the luminance image from the camera has caused the greatest among us to wring their hands in despair in both the traditional and digital darkroom. The great photographers have mastered the process and created masterpieces by turning the image into something that was seen and felt—luminosity, the perceptual image—rather than just the “babble of voices at a cocktail party,” as Ed Land referred to it 30 years ago.

I've shown in Part I of this book that this “babble of voices” can be silenced and how the clear, still tones of the masterpiece can emerge. In Part II, I'll show you how to create a workflow to implement the ideas we've covered so far, and I will demonstrate the workflow I currently use for black-and-white printing.

Tonerobics Exercises

Before you begin, go to www.georgedewolfe.com and click on Teaching. You will see a link for Downloads and PDFs where you can access all the files you will need to perform the following exercises.

Exercise 1: Print out file 1 and cut the 255 patches into individual pieces with no border. Put them in a plastic garbage bag and shake vigorously. Arrange all the tones in the order in which they were first printed. Do not look at the original file or its printed version while doing the exercise. Stop after 30 – 45 minutes. The gaps in the grayscale are your weak points in perception.

Exercise 2: Open file 2 in Photoshop, an image of what is called the “fundamental error” in visual perception. Select the middle gray inside of the smaller square of either black and white larger square in the image. Using the Brightness/Contrast control in Photoshop (Image > Adjustments > Brightness/Contrast), adjust the Brightness control until the two grays match perceptually. The thing about the “fundamental

error” in vision is not that it occurs, but how we find an effect that corrects it in a photograph. This is your introduction to finding the problem first, then correcting it.

Exercise 3: There are 8 exercise sets in Exercise 3. Work on each one separately. Using only the Curves tool (Image > Adjustments > Curves), correct the first image in each set (a) to match the second image in set (b).

Exercise 4: Open files 4a and 4b, called “George's Shot from Hell.” Use any method at your disposal in Photoshop to match 4a to 4b. This one will take you awhile.

Exercise 5: Download all the files in sets (a) and (b) for Exercise 5 and open them in Photoshop. Match the first to the second in each pair using only the Curves tool. This should help you with progressively harder articulation problems. This exercise shows you that the problem is a perceptual one, not a technical one.

Exercise 6: This is my edge detection exercise. Download and open file 6 in Photoshop. Increase the tonal value of each square until the tonal value indicates a just perceptible edge separation between the two. Now reverse the process.

Exercise 7: Open the files for sets (a) and (b) in Photoshop. Match the sharpness and blur of each image set using any method you choose.

Exercise 8: This exercise is about emotion scales. Tonal values can also represent emotions and feelings all by themselves without content. In Photoshop, open file 8, a simple grayscale, and try to adjust each tone in relationship to the others to represent anger, or joy, or happiness, or hope, or other human emotions. Only do one emotion per image. This is hard, but worthwhile. Seek expression until the scale is right. Don't look at the tones; feel them. This exercise is the basis for creative and expressive work in black-and-white photography.

Exercise 9: This exercise examines key value scales. What is your key value and how would you find it? One way might be to look at the histograms of 50 – 100 of your black-and-white images to get a rough idea of tonal distribution. Another might be to arrange the gray patches in Exercise 1 into scales that please you, and then try to emulate them. Lastly, and my favorite, is to find a master painter you like—not a photographer—and analyze their grayscales. Then, go out and try to duplicate that grayscale in your own work. This exercise will open the world of black-and-white expression to you.