Photography 101
Making better pictures

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by Ken Reek

NOTE: Some browsers (i.e. Firefox) do not display this document correctly. I recommend that you download it and view it in Adobe Reader.

Hi! My name is Ken Reek, and I've been taking photographs for nearly 50 years. I studied professional photography at the Rochester Institute of Technology for two years before veering off into the computer field, which became my career. But I've enjoyed photography as a hobby ever since.

What kind of camera do you use?

- Point and shoot
- SLR
- Cell phone

You can get great pictures with any kind of camera. What matters most is:

1. where you stand, and
2. where you point it!

Having said that, I must point out that higher quality cameras can give you higher quality results (e.g. sharper, better exposed, able to be printed as posters, etc.).

Rules for Good Photographs

Let's start right away with the "Rules for Good Photographs."

Ansel Adams, one of the greatest landscape photographers of the 20th century, said that "There are no rules for good photographs, there are only good photographs."

What this means is that there is no formula that will give you great results every time, and even techniques that work most of the time will not be applicable in some situations. Fortunately, with digital technology, we can take lots of pictures these days without the costs associated with film and processing that we would have incurred years ago. Therefore, I encourage you to try lots of different ideas when you're looking for that outstanding image.

Having said that, there certainly are some techniques that many photographers find useful. To illustrate a few of these, let's start by looking at some photographs. See if you like them and, if you do, try to figure out why. Later we'll use each of these photos to illustrate one or more techniques.
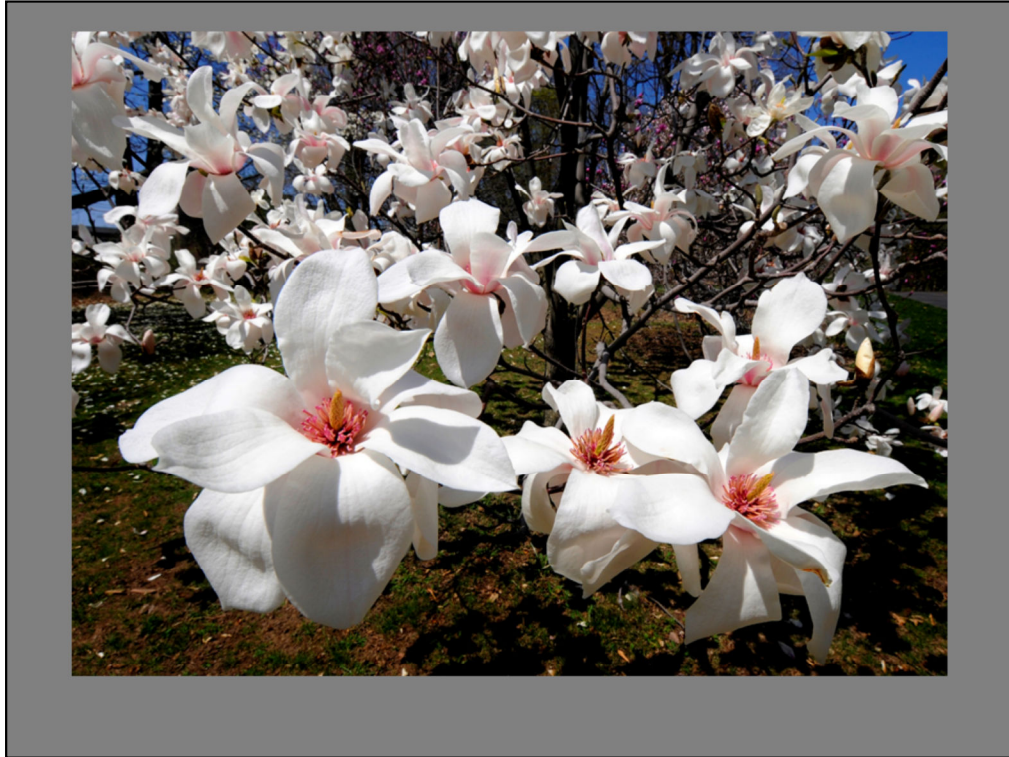
Great Blue Heron in Montezuma National Wildlife Refuge, near Seneca Falls NY. Circa 1980.

Tenaya Lake, Yosemite National Park. September 2004

Jet contrails, Interlocken Trail, Finger Lakes National Forest, near Watkins Glen, NY.
November 2004

Magnolia tree, Highland Park, Rochester NY. April 2008

Rose, Sonnenberg Gardens, Canandaigua NY. June 2007

What is the goal of the photo?

- Record data
- Preserve memories
- Make a pretty picture

Please yourself

The first thing you must decide upon when taking a photograph is why you are taking it. Are you:

•Merely recording data (e.g. home inventory, creating instructions for some task)?

•Trying to preserve memories (e.g. vacation or birthday pictures)?

•Making a pretty picture (e.g. to hang in your home)?

For all of these uses, you only need to please yourself. That is relatively easy (though, of course, we'd all like to improve our success ratio).

What is the goal of the photo?

- Record data
- Preserve memories
- Make a pretty picture

Please yourself

- Sell!

Must please others—much harder to do

On the other hand, if your goal is to get an image that you can sell, then you must please others—your audience—and this is much harder to do.
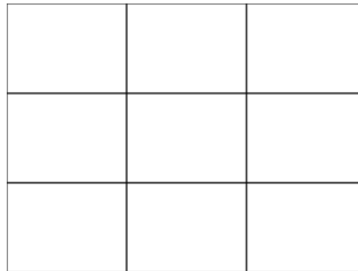
Composition

- Fill the frame!
- Look around edges in viewfinder
- Use tripod to improve results

We will begin with composition, which is simply **how the elements in the scene are arranged**.

1. The first thing to do is to **fill the frame** with your subject. Everyone has seen pictures where the subject is a small dot surrounded by large areas of irrelevant, distracting detail. You don't want anything in the photo that doesn't relate to the subject, so either *move closer* to the subject or *zoom in*—either technique will make the subject larger in the image.

2. **Look around the edges of the frame** for distracting details, such as things that poke slightly into the frame, or things that are cut off by the edge of the frame. **Reposition the camera** slightly, *move closer or farther* from the subject*, or *zoom in or out* as needed to eliminate these details.

3. Finally, it is easier to accomplish these tasks if you **use a tripod** to hold the camera steady while you're looking and fiddling. (I have to admit that I personally use a tripod far less often than I ought to. The result is that I'm cropping my pictures more than I would otherwise.) If you have a camera without a tripod socket (such as a camera phone), you can still use a tripod—just use Google to search for "camera phone tripod bracket" and you'll find lots of gadgets that solve this problem.

Composition

- Rule of Thirds:
  - Divide image area into thirds, vertically and horizontally
  - Put something interesting on the lines, or better yet, at the intersections

One of the most successful tools of composition is called the **Rule of Thirds.** This is very simple:

1. Divide the image area into thirds, vertically and horizontally.
2. Put something interesting on these lines or, better yet, at the intersections.

The result tends to be more interesting than if the subject is merely centered.

Let's look at some examples:

Here is the Great Blue Heron. Notice that the heron is on one of the vertical lines, and his body is at one of the intersections.

Also, the bird is looking into the frame—this is better than having him looking out. (This tip has nothing to do with the "rule of thirds," but is useful nevertheless.)

Here is Tenaya Lake. Observe that the shore is on horizontal line—I did this intentionally. The main line of clouds in the sky is on the other horizontal line (this was an accident, but I think it helps the image). Also, the clusters of rocks in the lake are near the bottom two intersections.

Sunset on the Interlochen Trail. The large tree is on vertical line. The little tree on the right provides some balance, even though it is not on any of the lines.
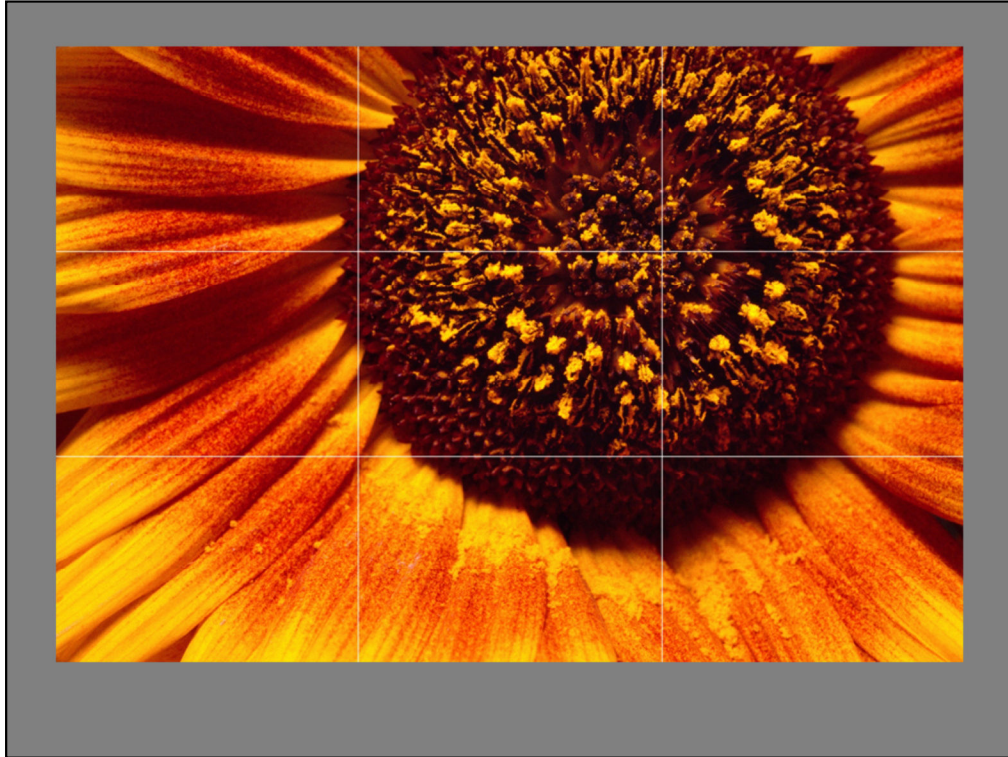
Sunflower, circa 1986.

The center of the sunflower is on an intersection.

If this were centered it would have an entirely different look, more like a sunburst. That could also be an attractive image, but this one seems more "dynamic" to me. Also, framing it this way lets me get more of the petals in the image (lower left corner) without having to zoom out (which would make everything smaller).
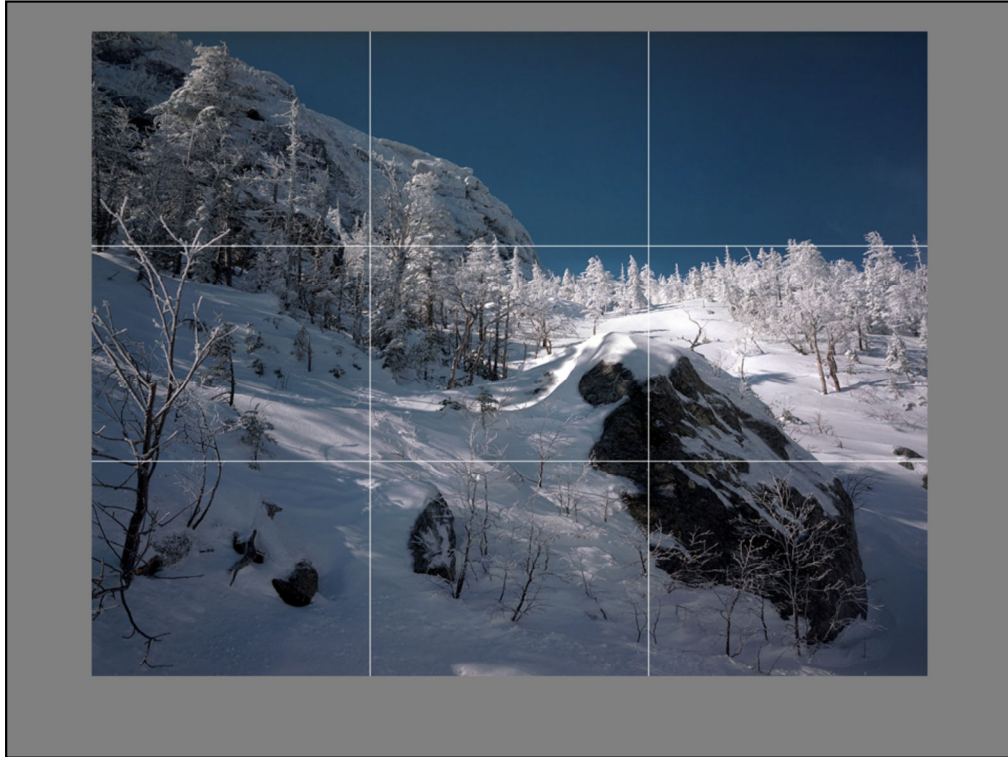
Atop Mt. Mansfield, Stowe, VT. Circa 1996

I rode the gondola up with a bunch of skiers, but I carried my big 4x5 inch camera instead of skis. I am standing on the deck at the back of the lodge looking toward the top of the mountain.

The large rock in the foreground is at one of the intersections, the tree line is near one of the horizontal lines, the rocky crag at the upper left is atop another intersection.

I particularly like the light in the trees just above the foreground rock.

By the way, some cameras have an option that puts these tic-tac-toe lines on the LCD screen as an aid to composition when you're shooting.

Composition

- Make the foreground & background interesting
- Diagonal lines are attractive

Try to **make the foreground interesting** and also **make the background interesting**. Move or zoom to eliminate uninteresting aspects, if possible.

Diagonal lines are often attractive in compositions. Here are a couple of examples.

Grizzly Lake, Yellowstone National Park. Circa 1991

The trees in the foreground are an obvious diagonal line, but the treeline from the center to the left is another diagonal. The foreground and the background both contain interesting elements that work together. (An interesting background that has nothing to do with the interesting foreground [or conflicts with it] would obviously not work as well.)

Now let's put the tic-tac-toe grid in and see where it falls.

The diagonal logs in the foreground lie across an intersection, the tree line is near a horizontal line, and the pine trees on the left are near a vertical line, as is their reflection. I cannot say that I saw all of this explicitly when I took the photograph— that experience was more like, "Wow, now that's pretty!" I've been doing "rule of thirds" composition for so long that I often simply move the camera until it looks nice, but the reason it looks nice is that it fits into the rule of thirds.

Norris Geyser Basin, Yellowstone National Park. February 2005

The trees are all vertical, bt the treetops form two diagonal lines, one from the upper left corner down towards the lower right, and another (rougher) line from just below the upper right down towards the lower left.

Let's look at the tic-tac-toe grid now.

Both of these diagonal lines go through intersections on the grid.

I wish the sky were blue, but you can't have everything. Someone more experienced in PhotoShop than I might be able to accomplish this manipulation, but I've never gotten results that look realistic when I've tried it.

Breaking the Rules

- Some scenes don't fit neatly into any rules
- If it looks good—shoot it!

Remember Ansel's advice: **there are no rules, only good photographs**.

The bottom line is simple—if it looks good to you, it *is* good. Take the shot—with digital cameras (unlike film) there is no cost.

Here are some examples where I've broken the rules and (I hope) improved the image by doing so.

Quaker Lake, Allegany State Park, near Salamanca, NY. Circa 1995

Do you think this is a pretty picture? If so, why?

Let's see how well it fits with the "rule of thirds" gidelines.

There doesn't seem to be much of anything at the intersections, nor is there anything that lines up with the vertical or horizontal lines.

Next, I'm going to crop the photograph differently—let's see how that changes things.
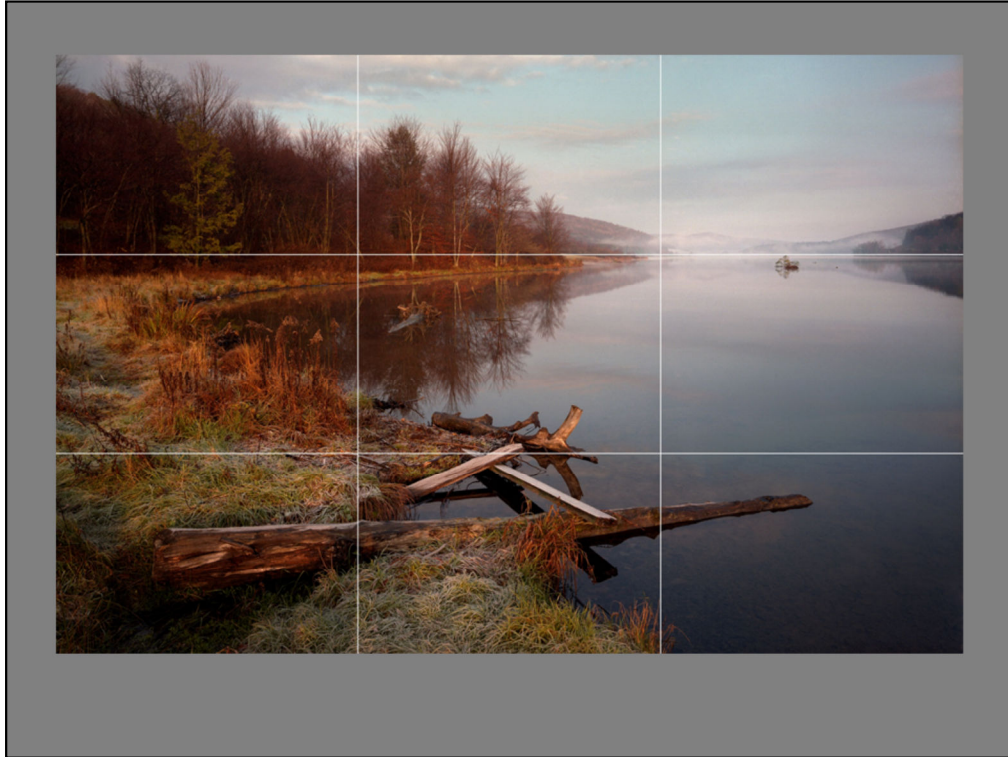
I have cut out some of the sky, and now some elements are closer to where they're "supposed" to be. The top of the lake is on the upper horizontal line, and meets the far shoreline at an intersection. The shoreline then stays very close to the line as you move toward the left edge of the picture. The logs and boards in the foreground are more nearly centered around the horizontal line.
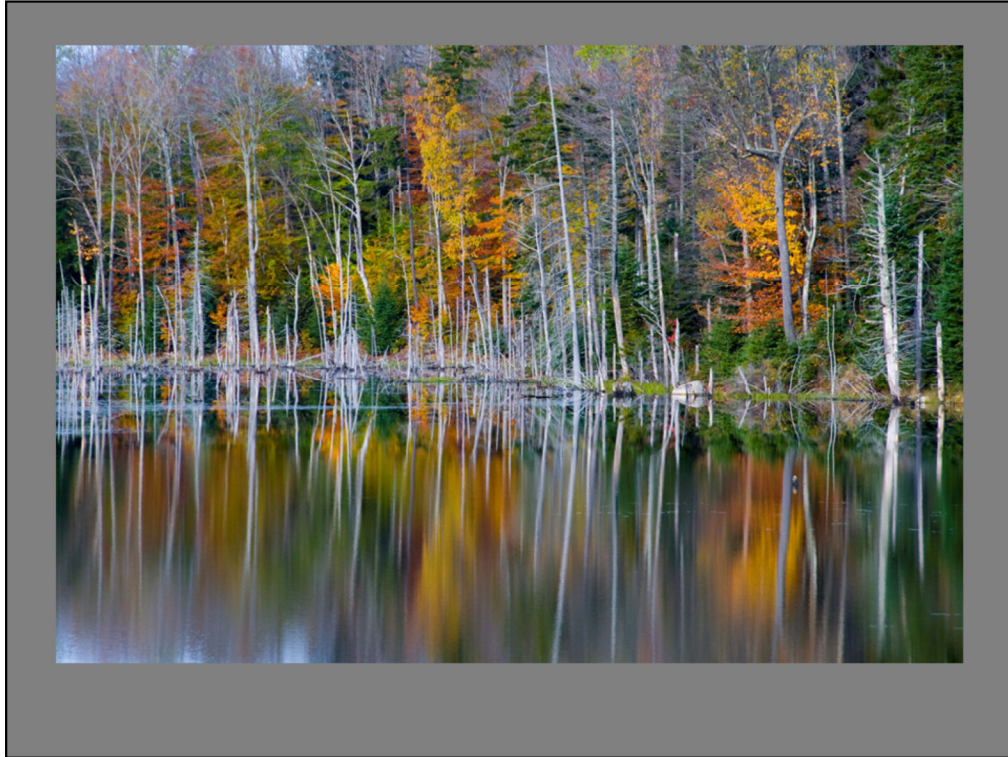
I'll take the tic-tac-toe lines out now…

This is a stronger composition than the original …

but I like the clouds at the top with their tinge of pink color, so this is the version that I kept.

Mason Lake, Adirondack Park, NY. October 2009

Nothing of consequence here is anywhere near the tic-tac-toe lines. The contrast between the color and white tree trunks (and their reflections) are what make this picture; centering the shoreline maximizes the amount of both that shows.
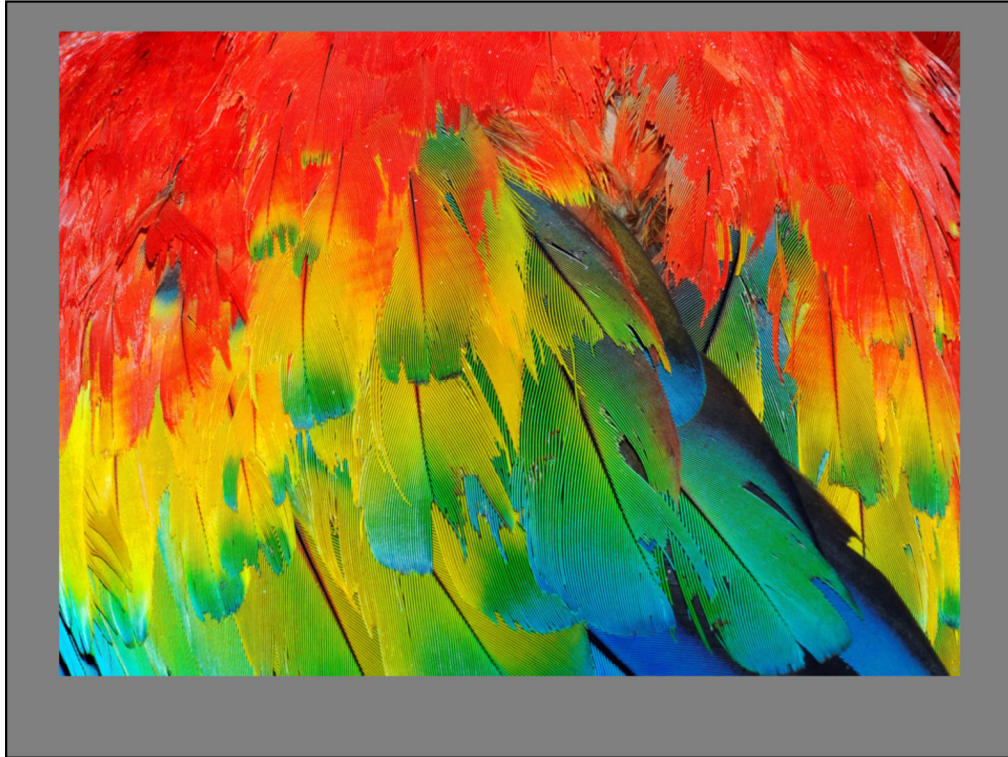
Scarlet Macaw feathers, Bird Kingdom, Niagara Falls Canada. December 2009

The macaw was sitting on someone's arm; I stood behind the bird and got close enough so that nothing but its feathers show in the image. This photo is entirely color and texture.

Autofocus Cameras

- Back in the stone age, you focused the lens yourself
- The first autofocus cameras focused on the center of scene
- Newer cameras decide where to focus
  - On nearest object
  - On people's faces
- May not be what you're interested in!

A long time ago, you focused the camera yourself. While slower than what we do today, manual focusing had the distinct advantage that you got to choose what part of the subject on which to focus.

The first autofocus cameras simply focused on whatever was in the center of the image. More modern cameras decide where to focus—some focus on whatever is closest to the camera, but some recognize faces in the image and automatically focus on those.

But what do you do when the point the camera has chosen to focus on is not what you would have chosen?

Overriding Focus

- Point focus area of camera to desired area
- Press shutter button half way to lock focus
- Aim camera to recompose scene
- Press button rest of the way

Many cameras will let you override the focus point. The usual technique is as follows:

1. Aim the camera so that the point it chooses is the point you want (this may require some trial and error on really "smart" cameras).
2. Press the shutter release button halfway down to freeze the focus.
3. Now move the camera to compose the photo the way you want it.
4. Press the shutter release button the rest of the way down.
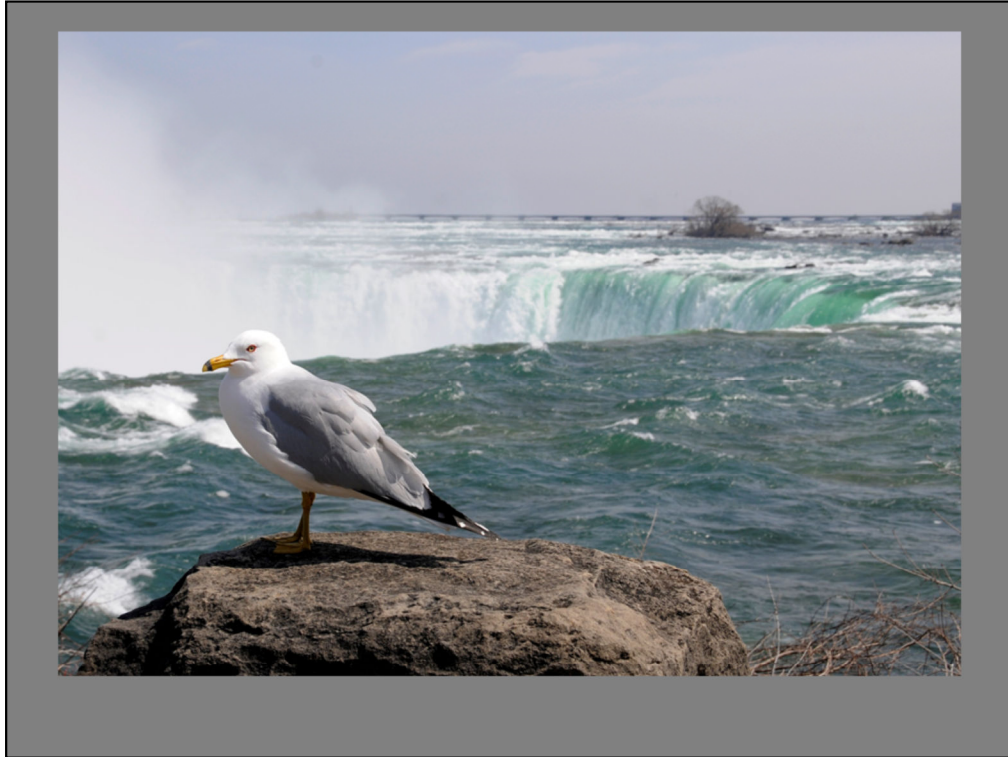
Seagull, Niagara Falls Canada

Here is a classic situation: the main subject (the seagull) is off center. A camera that focused on the nearest object might have done what I wanted to do (focus on the seagull), or it might have focused on the rock (which probably would have been good enough). But a camera that focused on whatever was in the center of the image would have selected the waterfall, and the seagull would then have been out of focus.

I aimed my camera at the bird and pressed the button halfway down. I then moved the camera to frame picture and made the shot.

In this example, I used a fairly large aperture (the opening in the lens—we'll talk more about this later) to blur the waterfall slightly—having the falls slightly out of focus emphasizes the seagull by making it stand out from the background.

Inca stone construction, Machu Picchu

Here the stone is the main subject, I focused on it and then recomposed the photo to center the window. Once again, I let the far mountain go slightly out of focus to emphasize the main subject—the stone work.

Letchworth State Park, New York, east side.

At first, your eye goes to the bright color on the far hill. But there are two people in the shadow to the right, and I wanted them to be the main subject. Once again, I focused on the main subject and let the background go a little out of focus—the splash of color balances the area that is shaded.

Autoexposure Cameras

- Not as smart as your eyes and brain
- Expose scene to an average luminance
- Fails if scene is generally dark (or light)
- Also fails if scene is high contrast

"Exposure" is simply the amount of light that the camera lets in. The more light that comes in, the brighter the picture will be; the less light that comes in, the darker it will be. Clearly, there will often be different amounts of light available (e.g. day vs. night, outdoors vs. indoors), and different scenes reflect different amounts of light (e.g. a snow scene vs. a dark forest). To get a good photograph, you need to let the correct amount of light into the camera—that is, determine the correct exposure.

Originally, you had to do this yourself, usually with the aid of a hand-held meter. This was slow, but it had the advantage that you could adjust the exposure to account for scenes with unusual lighting. Later, it was common for the camera to incorporate the meter, though you still had to use it to determine the exposure yourself.

Modern cameras use their built-in meter to choose the exposure for you. While this is faster and easier, such cameras are nowhere near as good at determining exposure for unusual scenes as we are with our eyes and brains. The reason is that the camera is pretty dumb—it chooses the exposure based on the average brightness of the scene. Usually this is pretty good, but scenes that are naturally dark will tend to be overexposed, and scenes that are unusually bright will tend to be underexposed. High contrast scenes (those with very bright *and* very dark areas) are a special problem—you won't be able to get both areas to look good. Instead, you must decide which areas are more important and use an exposure that is

appropriate for them.

Overriding Autoexposure

- Some cameras offer manual control
- Overexpose (or underexpose) at will
  - Overexpose to make scene lighter in photo
  - Underexpose to make scene darker in photo
- Check results immediately on digital cameras
- Keep all of your shots for post-processing

Some modern cameras offer a way to modify the exposure that the camera has chosen. Virtually all single-lens reflex (SLR) cameras offer manual exposure control, which lets you set all aspects of the exposure yourself. Many point-and-shoot cameras offer a way to increase or decrease the exposure from what the camera has chosen. If your camera has either of these options, you can use them to get better results for scenes with unusual lighting.

The key is to look at your results on the LCD screen. If the scene is unusually bright (such as a snow or beach scene) and your photo appears dark, **increase the exposure to make the image lighter.** If the scene is unusually dark (such as in a thick forest) and your photo appears too light, **decrease the exposure to make the image darker.** Then check your results again and make additional adjustments until you get the image you want.

In any case, I'd recommend that you keep all of your shots, even the bad ones. If your well-exposed image turns out to be flawed (it is a little out of focus, someone had their eyes closed, or you didn't notice that a stranger walked into the picture), you might be able to save the day by adjusting the exposure of one of the "losers" on your computer.

Lilly flower, Thailand. March 2011

This scene was generally dark, and the center of the flower was glowing. The camera lightened the scene to an average brightness, which caused the petals of the flower to be washed out (too bright) and ruined the flower's glow.
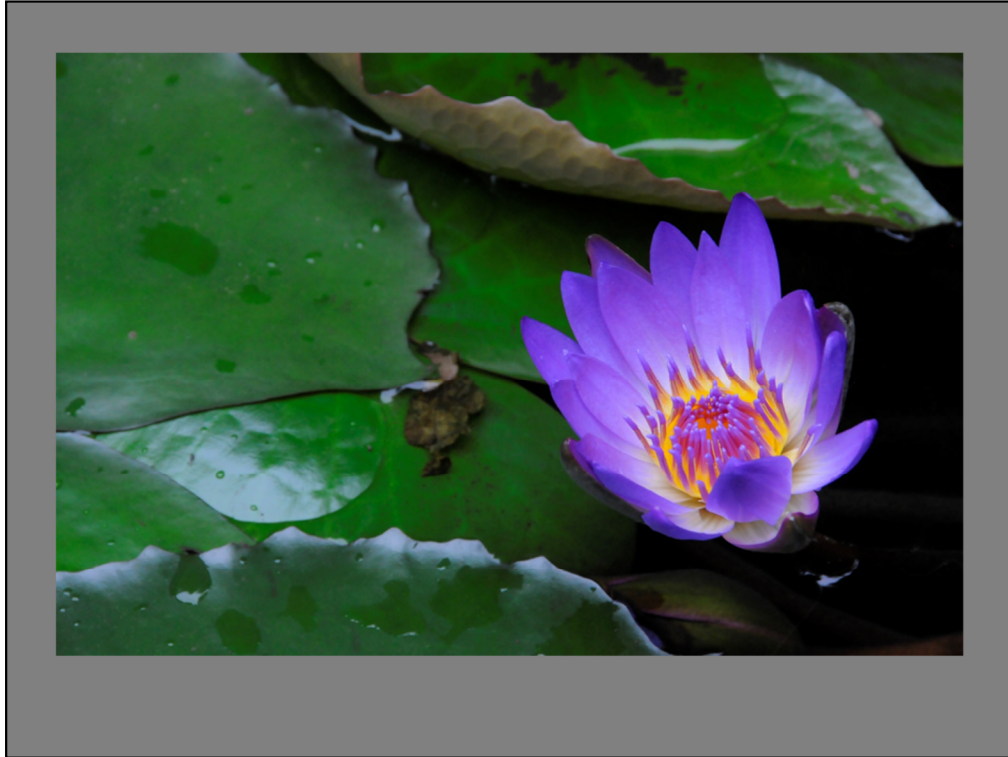
I took another picture and underexposed it by one stop (which simply means that I adjusted the camera to let in exactly 1/2 the light as the previous photo). The color in the petals is now much more saturated (richer), and center of flower glows as I saw it.
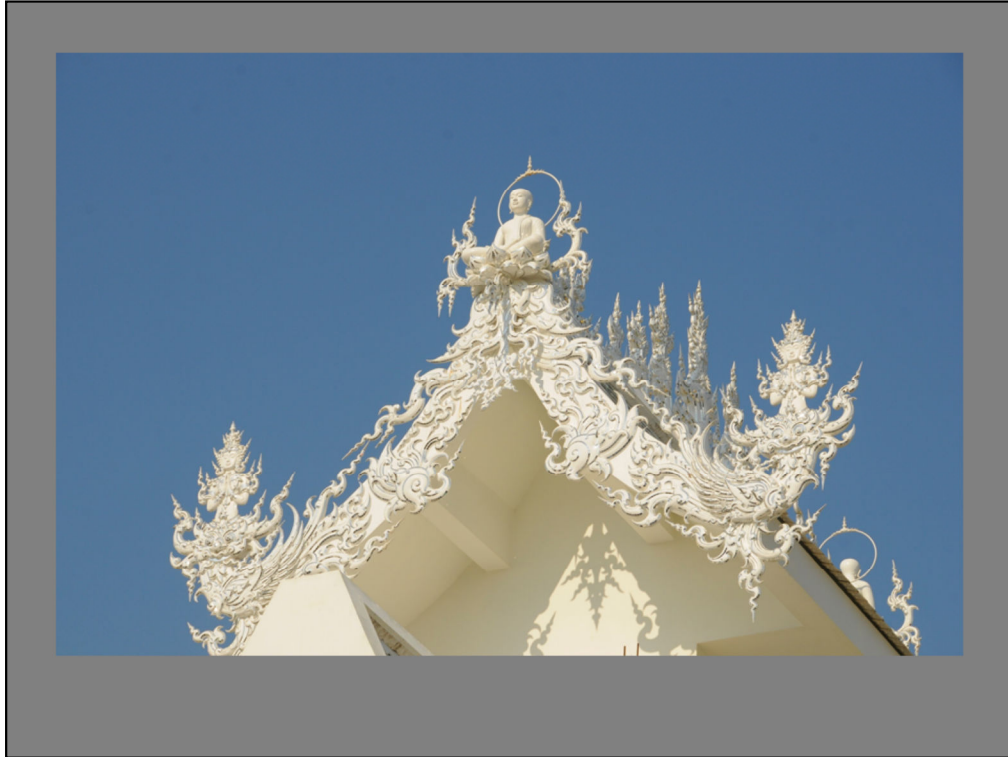
Wat Rong Khun (White Temple), Chiang Rai, Thailand. March 2011

The camera did pretty well with this scene, but I wanted something more dramatic. Underexposing by 1 stop would darken the sky, but would also have darkened the white of the building.

I have moved to a different position. Now I am getting reflections of the sun off of mirrored facets in the façade (the bright spots). These reflections caused the meter to think that the scene was brighter than before (indeed, it is—more light is coming into the lens) so the camera gave this image ½ the exposure of the previous photo, darkening the sky for the dramatic effect that I was looking for.

The white building is also darkened, but the bright spots, which are pure white, prevent the façade from appearing too dark. If I wanted to, I could lighten the façade a little on the computer. (We'll talk more about post-processing later.)

Lenses

- Normal
  - Supposed to duplicate "normal" field of view
- Telephoto
  - Bring distant objects closer
- Wide angle
  - See vast panaromas
- Zoom lenses combine all of these

Lenses can be categorized according to their magnification (technically, their **focal length**): *normal, telephoto,* and *wide angle.* (Actually, the term "telephoto" means a particular type of lens construction, but I'm going to stick with the common usage of the word).

Normal lenses are supposed to duplicate the "normal" human field of view. To me, this is a pretty vague concept, as our brains are extremely adaptable. When confronted with a vast panorama, we can take in the entire scene in a glance. But when we spot something interesting in that panorama, our brains can zero in on only a small part of what our eyes are seeing. So what exactly is the "normal" field of view? It doesn't really matter.

Telephoto lenses magnify the scene, making distant objects larger (i.e. they appear to be closer). Because of this magnification, you only see a smaller portion of the scene.

Wide angle lenses reduce the scene, making objects smaller (i.e. they appear to be farther away). Because of this shrinking, you see more of the scene.

Finally, **zoom** lenses combine all of these, allowing you to vary the magnification

with a single lens.

Perspective

- Apparent size depends upon distance from the subject
  - Closer objects appear larger
  - Farther objects appear smaller
- Lenses *do not* have different perspectives
- <u>Your distance from the subject</u> determines perspective

There is a common misconception among photographers that wide angle lenses have a different "perspective" than telephoto lenses. Here are the facts.

Perspective is just the difference in the apparent sizes of objects. This depends on the distance from you to the subject:

•*Closer objects look bigger.*

•*Distant objects look smaller.* (Duh!)

Imagine you are standing on the side of a road looking at a row of utility poles. The poles nearer to you appear taller, and those farther away appear smaller. You know that they are all the same height—it is the difference in their distance from you that causes them to appear to be different sizes.

Now, the difference in the apparent size of the first pole and the second pole is quite large, because the second pole is several times the distance from you as the first pole. However, the difference in apparent size of the 20th pole and the 21st pole is very small—this is because these two poles are nearly the same distance from you.

Wide angle lenses let you get closer, increasing apparent differences in size between different elements of the subject, whereas *telephoto lenses let you shoot*

from further away, decreasing the apparent differences.

Here is an example. This is my sister's house near Phoenix, Arizona.

The hill in the background is actually much taller than the house, but it appears to be the same height because the mountain is so much farther from me than the house is.
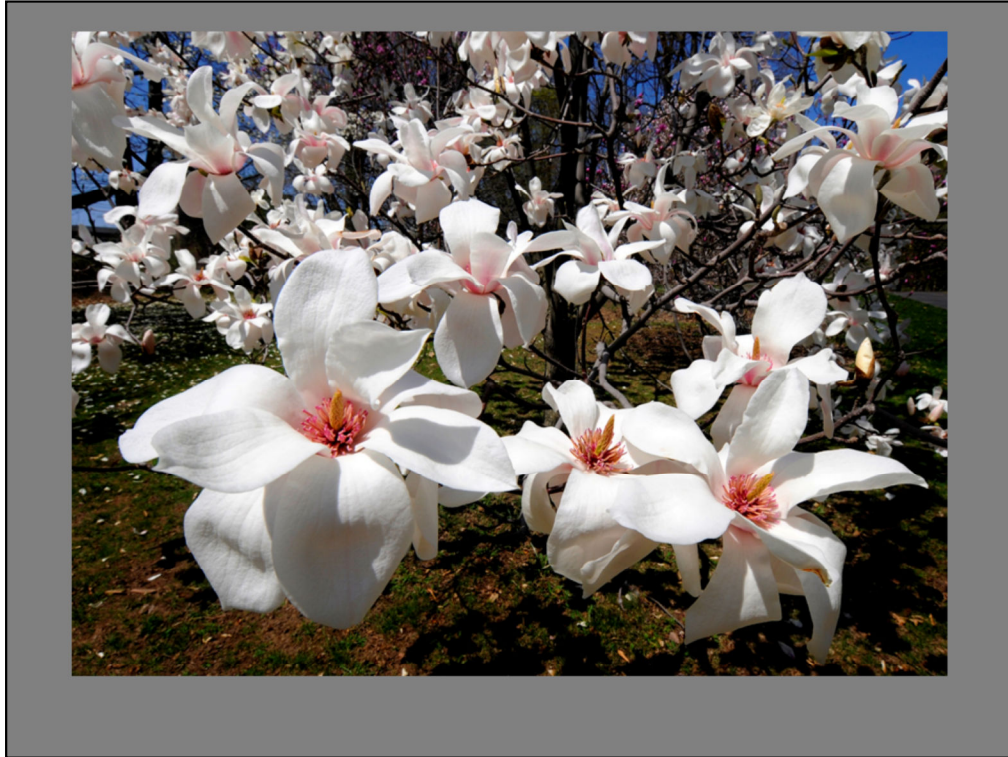
Mazatzal Mountains, Scottsdale, AZ

This photo was taken from nearly a mile away with a telephoto lens. The houses are still closer to me than the mountains, but they are nowhere near *as much closer* as in the previous image. To put this another way, I am now *much further* from the houses than I was before (so the apparent size of the houses is much smaller), but only *slightly further* from the mountains as I was before (so the apparent size of the mountains is about the same as before).

The telephoto lens *did not* give me this perspective; *being further away from the houses* did. The telephoto lens merely enlarged these distant objects in the picture. If you took a picture from the same spot with a wide angle lens and then cropped out everything that doesn't appear in the scene above, you would get an image with exactly the same perspective as this one.

If you're wondering why I cropped the image so that the houses were so close to the bottom, the answer is that there were more houses in the foreground that I wanted to exclude.

Here is another example. Clearly, all of the blossoms on this magnolia tree are roughly the same size. But I made this image with a 12mm lens—very wide angle. I am 6 inches away from the nearest blossoms. Because I am so close to these blossoms, they appear large in the photo.

However, I am several feet away from the flowers in the rear, so they appear much smaller. The difference in apparent size is due entirely to the differences in the distances from me to the various blossoms.

The wide angle lens merely lets me see a wide field of view, even though I am so close to the subject. (The wide angle lens also increases depth of field—we will talk about that later.)

If you used a normal lens from the same spot, you would only see a small central portion of the image above, but it would have exactly the same perspective as you see here.

Wat Phra That Suthon Mongkhon Khiri Temple, the "Reclining Buddha", Thailand

The only reason I'm showing you this image is so you can see how the staircase really looks.

This is the same staircase photographed with an extremely wide angle lens (12mm). I was very close to the bottom stair, hence it looks much wider than the stairs at the top, which are much farther away. The effect is that the staircase looks very long, and the "nagas" (snake heads), which are close, are quite dramatic.

Close-ups

- Provide interesting detail
- Unusual point of view

Taking close-ups is another way to provide an unusual point of view. Close-ups also can reveal interesting details about a subject.
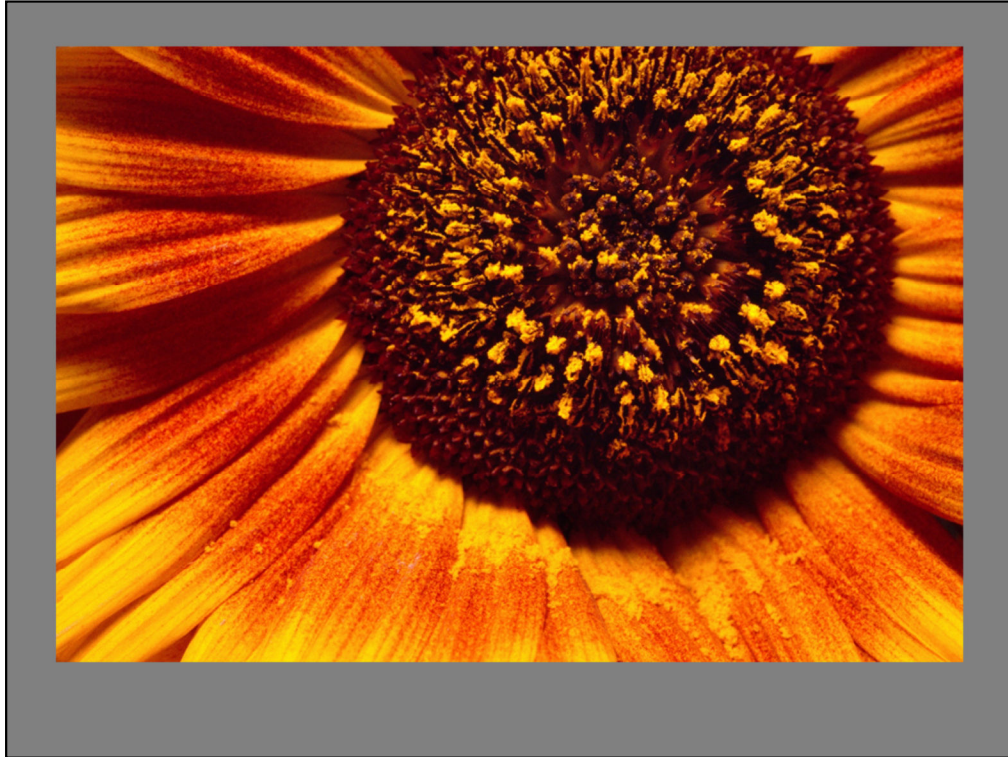
In this photo, getting in close eliminates everything except the flower, so there are no distractions to get in the way of the subject.

As for interesting details, look at the little piles of pollen grains on the petals underneath the flower's center.

Close-ups like this are well within the capabilities of point-and-shoot cameras.

Close-up Lenses

- "Macro mode"
  - Available on some compact cameras
  - Often available only on telephoto setting
- Macro lenses
  - For cameras with interchangeable lenses
  - Specially corrected for sharpness at close distances

Many small cameras have a **macro mode** that allows them to focus closer than normal. Sometimes this mode is available only on the telephoto setting of the lens, but not always—my little point and shoot camera can focus to within 1 ½" in its wide-angle setting, allowing for some very interesting perspectives.

Owners of cameras with interchangeable lenses have another option: the **macro lens**. This is a lens that is designed especially for close-up work, so you can get very close to the subject—often all the way down to 1:1 (life-size) reproduction. The resulting photos are also very sharp, much sharper than what you would obtain with an ordinary lens at such close distances.

Depth of Field

- Determines range of distances that are in sharp focus
  - Range is larger when focusing at a distance
  - Range is narrower when focusing closer
  - Range is miniscule at macro distances
- "Stop down" the lens to increase depth of field
 - Possible only when camera allows manual control of lens

At very close distances, however, "depth of field" (more precisely, the lack of it) becomes a major issue.

Depth of field is simply the *range of distances from the camera in which the subject will be acceptably sharp.* The key word here is "acceptably." In fact, the subject will be perfectly sharp only at the precise distance at which the lens is focused. However, parts of the subject that are fairly close to this distance will be sharp enough. The problem is that "fairly close" depends upon the distance from the subject to the lens:

•Depth of field is larger when focusing at large distances.

•Depth of field is narrower when focusing closer.

•Depth of field is miniscule at macro distances!

To increase depth of field, you can "stop down" the lens. The camera's lens contains an iris (aperture) much like your eye. This opening controls how much light gets through the lens: a larger opening admits more light, and a smaller opening admits less light. **Stopping down** the lens simply means to use a smaller aperture, in this case to increase the depth of field. The phrase "stopping down" comes from the term **F-stop**, which is a numerical measure of the size of the aperture.

Of course, this is possible only on cameras that allow manual control of the lens. Some point-and-shoot cameras have such a setting. If you're using an interchangeable macro lens, your camera definitely has such a setting.
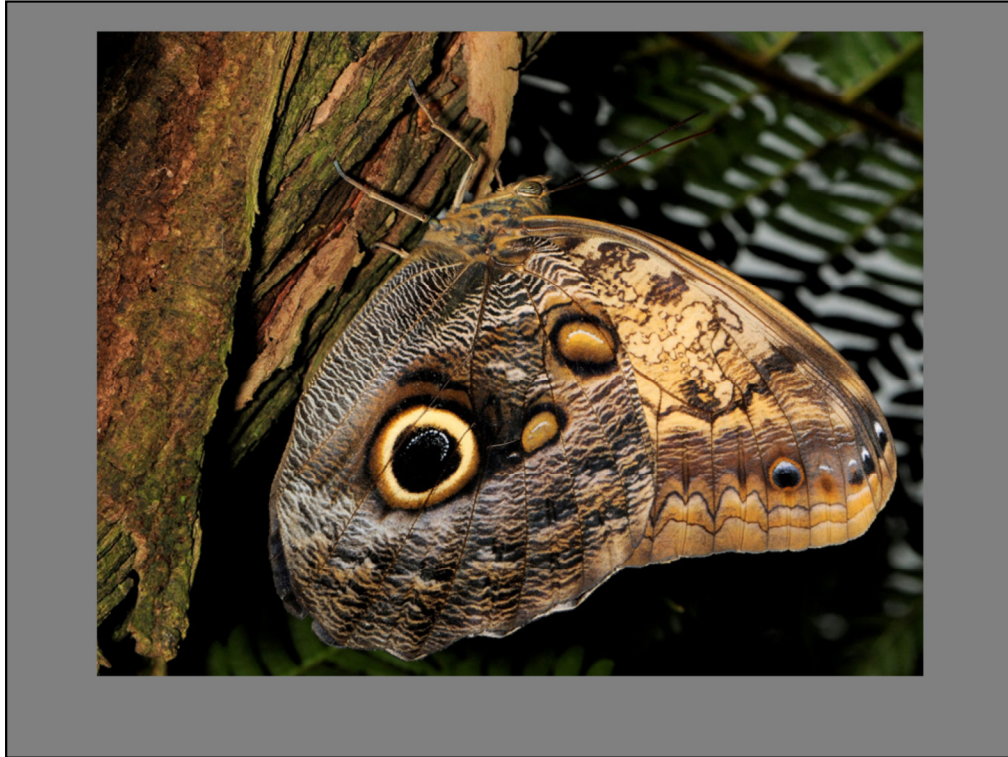
Owl Butterfly, Butterfly Conservatory, Niagara Falls, Canada

The butterfly is about 3 inches wide. It is parallel to the camera, so its entire wing surface is sharp.

Note the background is out of focus—it is too far away.

A compact camera might be able to get in this close, but the less of the photo would be as sharp.

I used a very small aperture (f/16) to increase the depth of field.

Atlas Moth antennae, Butterfly Conservatory, Niagara Falls, Canada

The antenna on the left is almost parallel with the camera and is fairly sharp. The one on the right is pointed almost directly at the camera.

- You can see the small area that is sharp—that is the plane of focus.
- Everything in front of and behind this area is blurry.
- The further from the plane of focus, the more blurry it is.

Intentional Blurring

Use a wider aperture to decrease depth of field.

- When we see a photograph, our attention is drawn to whatever is sharp.
- Shallow depth of field can be used to isolate the subject from its surroundings.

If there is a person or animal in the photo, *focus on the eyes.*

Because we tend to concentrate on whatever is sharp in a photograph, shallow depth of field can be useful to isolate your subject from the background. Use a wider aperture to decrease depth of field—the subject will be in focus but objects at different distances will be blurred.

If there's a person or an animal in the picture, focus on the eyes. Here's an example….
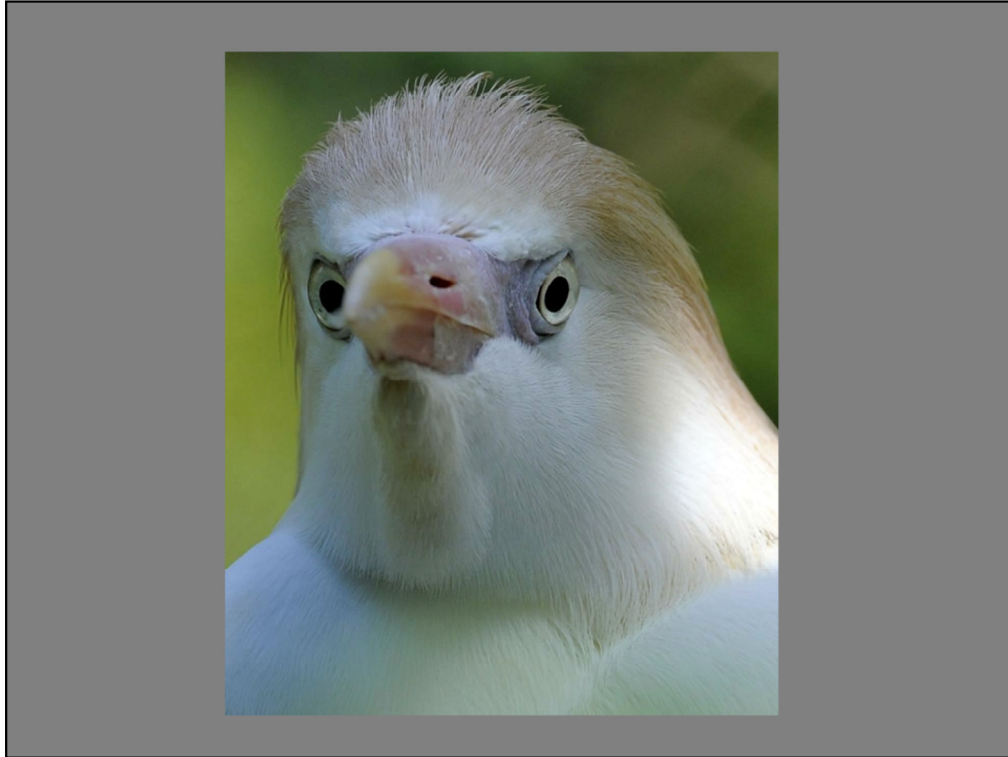
"The eyes are the window to the soul." English proverb.

Imagine this photograph if the tip of the beak were sharp and the eyes were out of focus—it would be a picture of a beak. But with the eyes sharp and the beak out of focus, it is a picture of a *bird*.

Also, the background is completely out of focus and isn't distracting at all.

Rules for Good Photographs

A good photograph is knowing where to stand.

- Ansel Adams

"Where you stand" determines almost everything about the photograph—specifically, its perspective and the positions of objects relative to one another.

Try different positions to see the difference it makes.

Look for the Angle

- Determine the main subject
- Find an angle that emphasizes the main subject and minimizes unwanted objects
- Unusual angles sometimes work well
  - Look up
  - Get down low instead of looking down

First, try to determine the main subject—what was it that attracted your attention to this photo in the first place?

Next, try to find a position that emphasizes the subject and deemphasizes everything else.

Don't be afraid to try unusual angles—they can give the picture additional interest. Here are some examples.
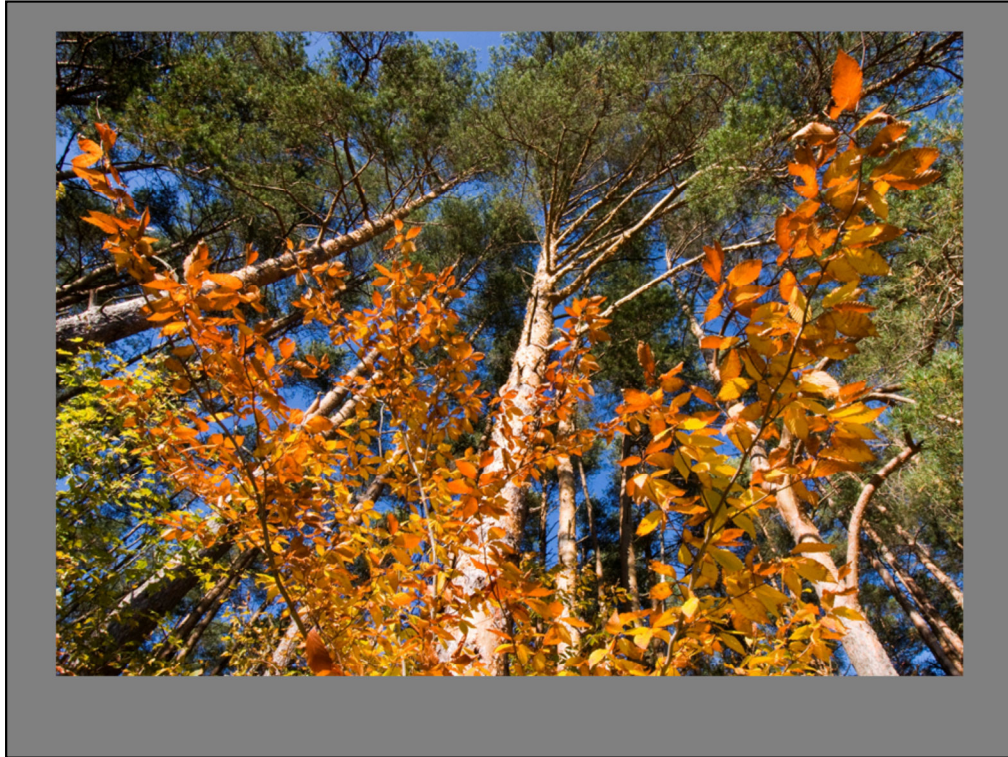
I was intrigued by this tortured tree at Olmsted Point in Yosemite NP. The problem was to isolate it from the background.

I used a large aperture to throw the background out of focus, but wasn't happy with this shot—the background is still too distracting.

Moving around to the other side of the tree yielded this shot. The tree stands out much better against the plain sky.

October in Allegany SP

I wanted to contrast the fall colors with the evergreens. Looking up at them eliminated the parking lot, picnic tables, and so forth from the background. As an added bonus, the deep blue sky is a nice contrast to the orange leaves.

Lady Slipper, Sapsucker Woods, Ithaca NY

For this shot, I was lying on my belly. The camera was about one foot off the ground looking directly at the flower. Light was provided by two electronic flash units. The background is dark because it is much further away from the flash units than the flower was. The diagonal line of the stem is an added bonus.

I think this view is more interesting than what I would have gotten by looking down at the flower.
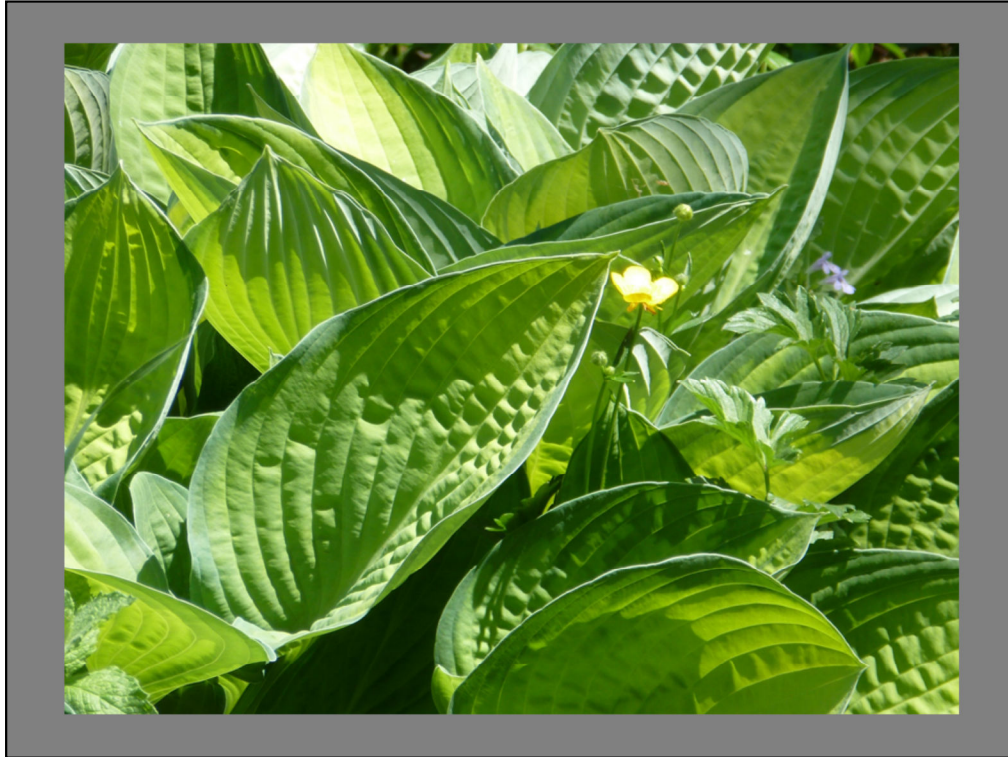
Linwood Gardens, York, NY

I liked the lone yellow flower amid all the green foliage, but from this angle the flower is lost.

By moving to a different position, I was able to place the flower in front of a dark background, which makes it stand out much better. The leaves make nice diagonal lines as well.

Unfortunately, the flower is overexposed. I should have adjusted the exposure to correct this, but I was using a new point-and-shoot camera and I didn't remember how to do it!

Polarizing Filter

- Can be adjusted to block polarized light
- Reduces reflections and glare
- Increases color saturation
- Darkens blue sky (in some directions)
- Can be used with some compact cameras

- If you are wearing polarized sunglasses, you can see the effect by tilting your head side to side.

Back in the old days of black and white photography, filters were widely used to achieve various effects, such as darkening the sky for a more dramatic effect. In this era of color, there is only one filter that I use: the **polarizing filter**.

Ordinary light is chaotic: think of it as a bunch of waves that are not aligned with each other. **Polarized** light, on the other hand, has waves that are all aligned in the same plane. When light is reflected in a certain fashion, it becomes polarized. Glare is a good example of this effect.

Now, think of the polarizing filter as a picket fence: if the slits in the fence match the direction of the waves of polarized light, the light gets through, otherwise it does not. The polarizing filter rotates, which allows you to control which light is blocked or let through. However, no matter how the filter is rotated, a portion of the non-polarized light always gets through.

By rotating the polarizing filter, you can reduce or eliminate glare, which increases the richness of the color of the underlying object. You can also reduce reflections, for example off of the surface of a pond, so that you can see beneath the water. But the most common use of the polarizing filter is to darken a blue sky. This effect is most dramatic when the camera is pointed 90 degrees away from the sun (i.e. the effect will be greatest when one of your shoulders is pointing at the sun).

If you are wearing polarized sunglasses, you can see this effect by simply tilting your head from side to side to rotate the sunglasses.

At an elevation of 8,300 feet, the sky was already a rich blue. I used a polarizing filter to darken the sky to increase the dramatic effect.

Polarizing Filter and Glare

- White light glancing off of a surface becomes polarized
- The polarizing filter eliminates this glare
- What shows is the true color of the object
- Next example: taken with a point-and-shoot camera through my sunglasses!

When light glances off of a surface at an oblique angle, the resulting glare is strongly polarized. The polarizing filter can eliminate much of this glare, allowing the true color of the object beneath to show instead.

Japanese maple tree, Linwood Gardens, York NY

In this photo, the sun was directly behind the maple tree, and the resulting glare is quite pronounced—many of the leaves in the tree appear to be silver.

For this photo, I held my polarized sunglasses in front of the lens of my point-and-shoot camera and rotated them until I saw that the glare was minimized. Now the true color of the leaves shows through.

Note: there is NO filter or adjustment in PhotoShop (or any other image processing software) that will accomplish this same result!

Polarizing Filter

- Also enhances rainbows!

A rainbow is formed when light reflects through water droplets. During this process, the light becomes polarized.

If you rotate the polarizing filter to minimize the light from the rainbow and then turn the filter ¼ turn in either direction, you maximize the light from the rainbow while reducing some of the non-polarized light around the rainbow. The result is that the rainbow is enhanced.

Crawford Notch, New Hampshire.

Scattered drizzle produced this rainbow. This photo was taken without the polarizing filter.

The same scene a couple minutes later, but with the polarizing filter adjusted to maximize the rainbow. All of the light from the rainbow gets through the filter, but some of the non-polarized light from the rest of the image is blocked. The result is that the rainbow is brightened relative to the rest of the scene.
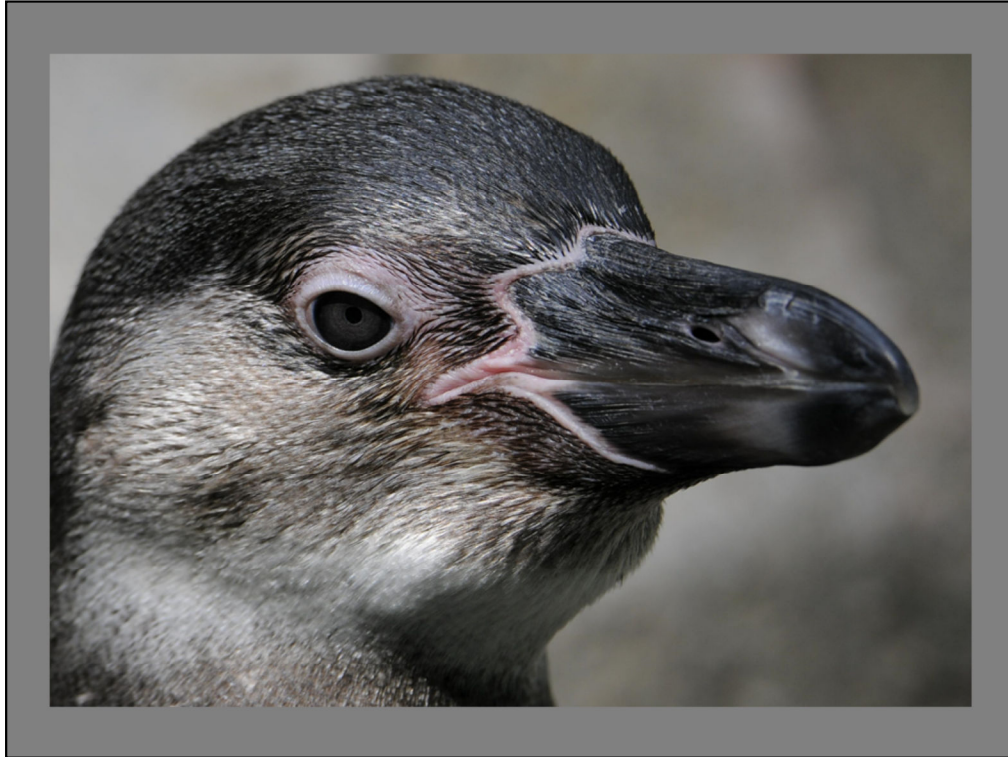
Postprocessing

- Much easier in the digital world
- Correct errors
  - Exposure
  - Color balance
  - Cropping
  - Cannot correct focusing errors!

In the pre-digital age, image manipulations were done in the darkroom. What we can do today with digital processing is enormously more versatile.

Many cameras today come with some sort of image processing software, and you can spend hundreds of dollars to purchase software with more features and capabilities than the basic versions. I will show you some examples of some of the things that can be accomplished with such software, but I don't have the time or knowledge to teach you how to do these things in PhotoShop. However, many school districts offer adult ed courses: try typing "photoshop course your-city-name" into Google and you'll likely get some useful links.

The types of things you *can* do on the computer include cropping,and correcting exposure and color balance errors. However, you cannot correct focusing errors—if an image is out of focus, you have only two choices:

1. Figure out some way to use it as an abstract image.
2. Delete it.

If the bird's eye weren't sharp, it would not be worth keeping.

Postprocessing

- Enhancements!
  - Crop
  - Eliminate unwanted elements
  - Eliminate dust spots
  - Change exposure
  - Change color balance
  - Change color saturation
- Biggest challenge for me—*don't go too far!*

You may have seen collections of photos that circulate on the Internet with titles something like

"When God Paints"

To me, these all look fake because they have been enhanced too far. The key to enhancing photos is to not go so far that they no longer look realistic.
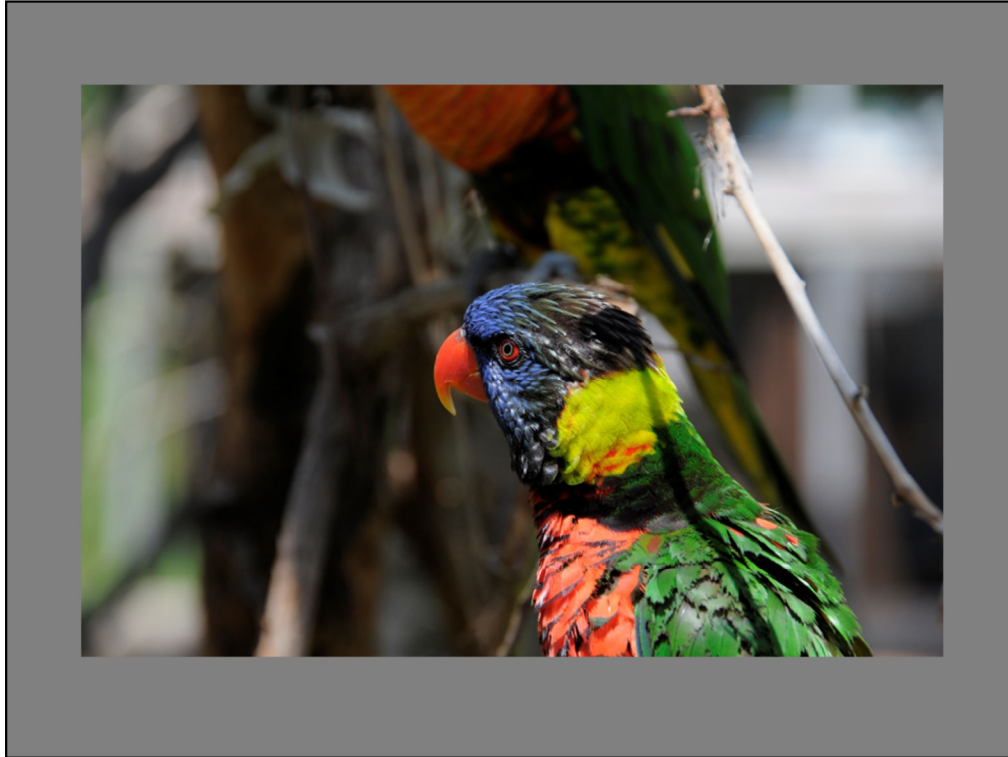
Lorikeet, Columbus OH zoo, August 2013

You often cannot frame pictures of animals the way you would want because they are moving around. This lorikeet is a good example—I was happy just to get the image in focus. But the composition is lousy—there is too much irrelevant detail that distracts from the bird. I'm going to crop the image to eliminate most of this stuff.
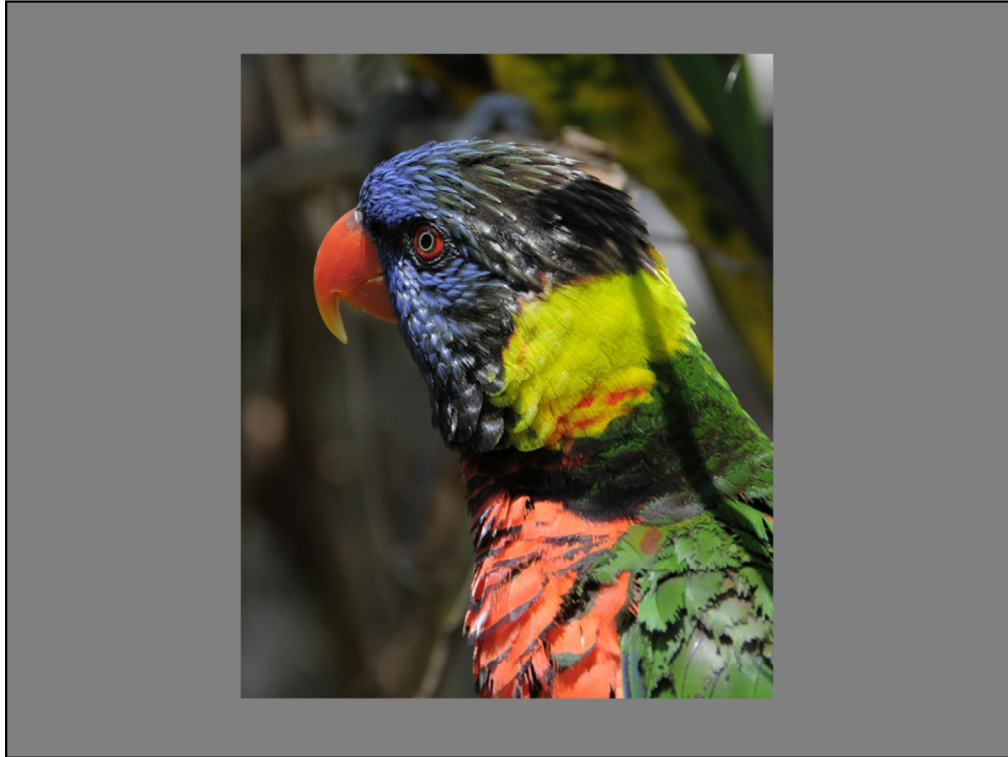
This is much better, but I noticed that the feathers on the bird's breast were not as intensely colored as those on its head, so I tried an even tighter crop.
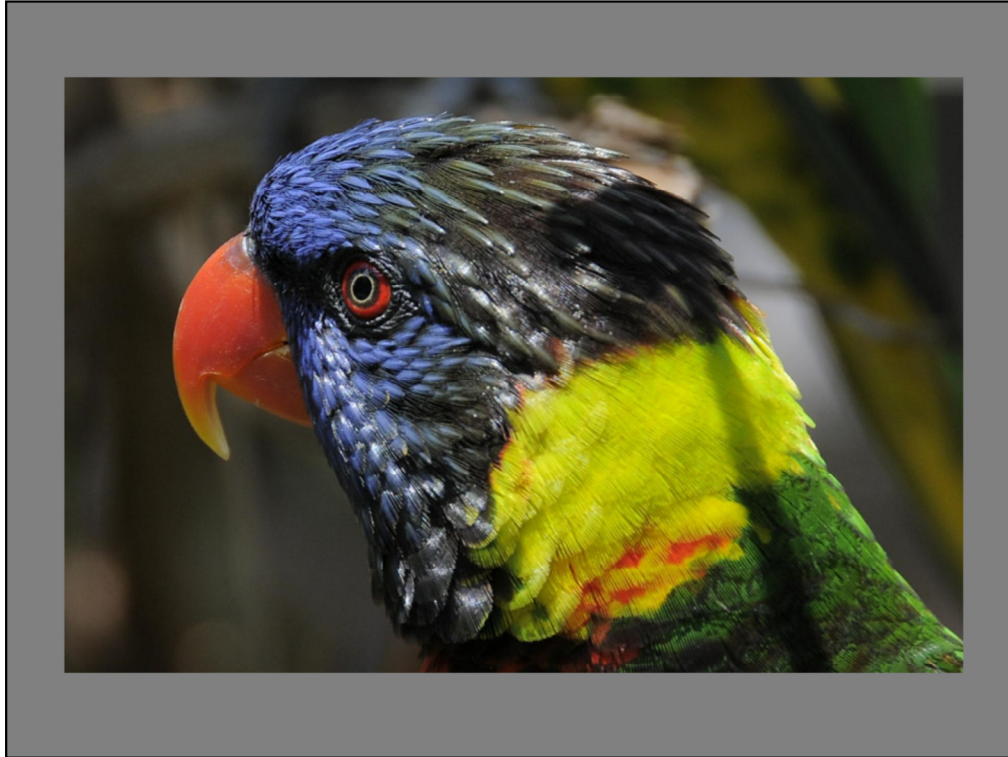
I like this image more than the previous one. The moral of this story is to keep trying things even after you've gotten something that looks good—you might just find something even better.

Here is a flower, also at the Columbus zoo. But the color seemed a little washed out compared to what I remembered of the flower. If I had noticed this when I took the picture, I could have adjusted the exposure to correct the color.

I've used software to darken the photo, which makes the color richer and more like what the flower originally looked like.

Olmsted Point, Yosemite NP.

This is the picture just as it came out of the camera. I have my camera set to record lower than normal contrast (on the theory that I can then record images with a wider range of brightnesses), but this was way too flat as well as too dark.

Also notice the dust spots in sky above and to the right of Half Dome.

Also notice person having lunch at extreme left of frame!

Same photo, cropped slightly. Lunch-eater was eliminated.

Exposure and contrast have been corrected.

Dust spots eliminated. In later years, I modified this photo to reduce the noise in the image caused by the high ISO I used, unknowingly, on my first digital camera.

Granite Mountain, Scottsdale AZ

This sunset looked better in real life than the photo turned out.
Also, I never saw the high tension power line in the lower left corner of the scene.

Enhanced to intensify the color of the sunset.

Also, I've removed the power line.

Lower Falls, Letchworth SP. Taken from the CCC bridge over the river.

The problem is the excessive contrast—
> If you expose for the sky, the river is too dark
> If you expose for the river, the sky and trees are washed out.

Cropped and enhanced.

I exposed for the sky but lightened the river enough to reveal detail. (Digital is so accommodating!)

The contrast in the sky is increased, making the clouds more dramatic.

The color in the trees is enhanced.

As it came from the camera.

Modifications:

1. Crop to concentrate on the foreground flowers (eliminate person on the right)
2. Adjust exposure and contrast
3. Darken the ground to emphasize the flowers
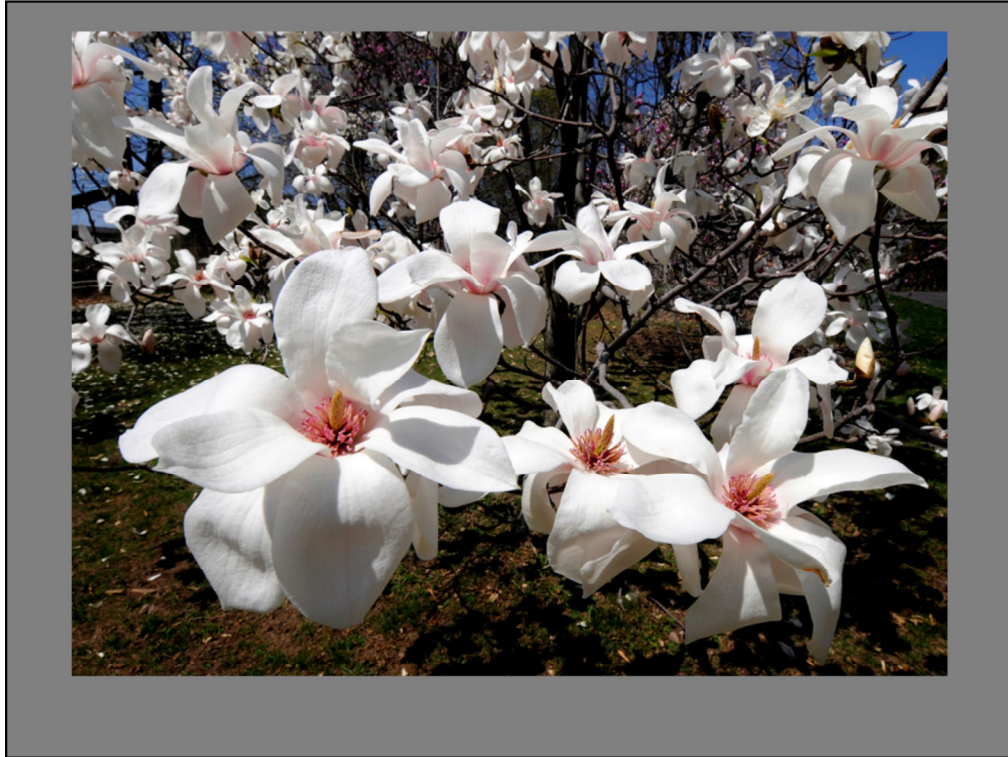4. Increase color saturation

First: crop

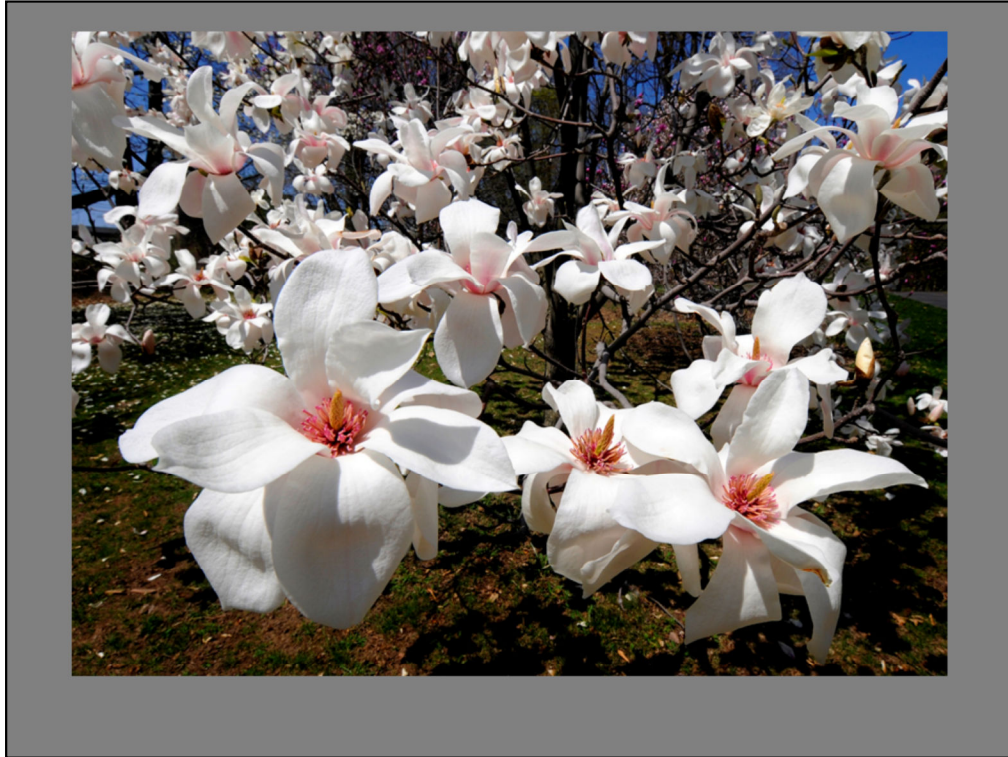Next change: adjust exposure and contrast

Third change: darken the ground to emphasize the flowers

Final change: increase color saturation.

Look at center of left foreground flower

Final result.

Note: I am optimizing the photo for best appearance on a print.
If I were optimizing it for projection, I would do some things differently.

Addendum: Smart Phone Cameras

Smart phone cameras now rival handhelds
in megapixels and image stabilization

Are there any special techniques for them?

An earlier iPhone had an 8 megapixel camera—this is more than my first digital Nikon SLR. Current phones are even better. You can take stunning photos with a camera of this quality if only you take a little time to do so.

Here are some techniques that may be helpful.

Addendum: Smart Phone Cameras

1. Get close—fill the frame with your subject
2. Don't zoom—get close instead
3. Get a tripod, especially when subject is dark
4. Take lots of shots from different angles, choose the best one later

1) Get close!
2) Most of these cameras use "digital zoom" which reduces quality by cropping the image. Get close instead unless you want a particular perspective
3) Search Google for "smartphone tripod" and you'll see lots of alternatives
4) It costs nothing to take lots of shots

Addendum: Smart Phone Cameras

5. Try different camera apps
6. Don't rely on the flash
7. Keep it clean
8. Share your memories

Thanks to KOA KOMPASS for these tips!

5) The phone came with a camera app, but there are others out there—some free—that you may like better

6) The "flash" is some LEDs—use only as a last resort. Look for other light sources instead (e.g.window, campfire)

7) There's no lens cap on this thing! Wipe the crud off the lens once in a while!

8) There are lots of ways to share digital photos on the Internet, but you can still make prints, or go online and create your own photo book:

snapfish.com

shutterfly.com

or search Google for "make photo book"

See more of Ken's photos at
www.KMRConsulting.com

Questions?