Chapter 1

Tap the Power of Every Shutter Speed

Have you ever counted how many shutter speeds your camera has? Like many digital SLRs, my camera has over fifty marked shutter speeds. Yours probably has a similar number. That's a lot of shutter speeds and it can be an overwhelming number when it comes time to choose the appropriate setting for a specific situation.

That tally raises an important question: What can you possibly do with over fifty different shutter speeds?

Well, that's what this introductory chapter is all about. These pages show you some of the fantastic pictures you can take once you learn how to use the full range of your camera's shutter speeds. As you look at the photographs and begin reading, you may want to pick up your camera and experiment with some of the shutter speed settings used in these introductory pages. That's not a bad idea. In fact, whenever you get inspired by a tip or a photo or one of your own ideas, bookmark your place and go out and shoot some pictures of your own.

I'll introduce you to some major players in the shutter speed lineup, but I'm not going to bore you by talking about every single shutter speed setting. After all, there's not much difference between the results delivered by neighboring shutter speeds such as 1/15 second and 1/13 second, or 1/500 second and 1/640 second. Instead, I'll give you an overview of a shutter speed series as its duration doubles, starting with the fastest shutter speed available—1/8000 second. So the sequence of shutter speeds I'll cover goes something like this: 1/8000 second, 1/4000 second, 1/2000 second, 1/1000 second—all the way up to 8 hours.

In the discussion of each shutter speed, you'll find the subjects it's best suited for, some of the challenges it presents, some techniques associated with that shutter speed, and occasionally a bit of shutter speed history or technology. Best of all, you'll see the types of pictures you can take with each shutter speed. Keep in mind this is just an introductory chapter that shows you the power and potential of shutter speed selection: the real nitty-gritty nuts and bolts about using shutter speeds comes in the later chapters.

Although thus far I've dodged the question of why your camera has so many shutter speeds, the answer is fairly simple. Your camera has so many different settings for the same reason your golf bag holds so many different clubs and your tool kit has so many sizes of drill bits.

The answer to my question is that variety—be it in golf clubs, drill bits, or shutter speeds—allows you to match the correct tool to your situation: a driver to make a long tee shot, a sand wedge to blast out of a trap, a putter for the green. And so it is with shutter speeds: with so many settings to select from, you can confidently reach beyond your comfort zone for fresh, more-challenging subjects. You can adapt to most lighting conditions and not feel intimidated by inclement weather or poorly-lit interiors. With so many shutter speeds to choose from, you can take excellent photos in almost any situation, anytime you like, anywhere you want.

Still not so sure of that? Well, read on and see for yourself.

Selecting the right shutter speed can transform a subject. Carol Doeffinger used a shutter speed of 1/125 second (f/5.6) to transform this reflection of a bridge in the Ohio River into a colorful abstract.

When you want to be absolutely certain to stop the movement of a fast flying subject like an eagle, set your camera to a high ISO (800 to 1200) and your shutter speed to 1/8000 second. Photo by Herb Chong. Exposure at 1/8000 second, f/5.6. Photo © 2007 Herb Chong

1/8000 Second—the shutter speed of NASA

As of this writing, the absolute fastest shutter speed available on a production model *single-lens-reflex camera* made anywhere in the world is 1/8000 second. It's blazingly fast and, not surprisingly, it's the best choice to use when you're photographing blazingly fast subjects.

It's a shutter speed so fast, in fact, that it strains your camera's ability to deliver it. To use 1/8000 second, you need to meet four conditions: a sunny day, an ISO of 1000 or higher, a large aperture lens (f/2.8 to f/4), and a board certification that indicates you're qualified to handle a camera that's faster than your brain. These are the challenges. Let's find out more about what 1/8000 second has to offer you.

What sort of jet-propelled subjects can you stop with 1/8000 second? Well, a trip to the Bonneville Salt Flats, Cape Canaveral, or the Blue Angels training grounds

can give you the answer to that question. And would there be any members of the animal world that 1/8000 second can't freeze in-flight or on-the-run? Well, neither stooping peregrine falcons nor charging cheetahs can escape its lightning-swift blink. Possibly, on a good day, the one living creature that can outrace 1/8000 second is the humble hummingbird, or to be more precise, just its rapidly beating wings.

Some human artifacts can also easily outrace this top shutter speed. As swift as it may be, not even 1/8000 second can freeze a speeding bullet—not even a slow one, with a doddering muzzle velocity of 1000 feet per second. During that 1/8000 of a second, the bullet actually moves over a full inch, thus rendering it blurred in a hypothetical photo. The only recourse to halt objects so fast that they slip the grasp of 1/8000 second is *electronic flash*. Advanced electronic flash can emit bursts as short-lived as 1/100,000 second, fast enough to make a speeding bullet dawdle even more than it does in the movie, *The Matrix*. The last two pages in this chapter talk a bit more about the stopping powers of electronic flash.

Have you ever taken a picture at 1/8000 second? Well, let's get to it. On the next sunny day that you're out with your camera, find some very fast action, set your ISO to 1200 and your shutter speed to 1/8000 second, and give it a whirl.

1/4000 Second—the shutter speed of NASCAR

This is the fastest shutter speed on many top-of-the-line consumer and prosumer dSLR cameras. (Prosumer cameras are for photographers who shoot like pros, but don't need all of the bells and whistles that professional cameras feature.) Although a step behind its 1/8000-second big brother, 1/4000 second is extraordinarily fast and more practical. It's more practical because you don't need a super sunny day or an extremely high ISO to achieve a good exposure.

Keep in mind that while you may need 1/8000 second to freeze the action of super-charged subjects, for nearly all other fast subjects 1/4000 second will do nicely. For NASCAR racers, Olympic sprinters, trampoline jumpers, speeding motorcyclists, and charging elephants, 1/4000 second can put them on your gallery wall as sharp as a tack.

To achieve a good exposure with such a fast shutter speed typically requires a bright day, a high ISO setting (400 to 800), and a lens with a fairly large aperture, such as f/4 or f/5.6. More important than the demands fast-action photography puts on the camera are the demands it puts on you.

Fast-action photography requires you to demonstrate both lightning-like reflexes and superb anticipation. Facilitate your quick reflexes with good planning by picking out a spot you know the subject will pass in front of. Then, instead of trying to track the subject with your camera, pre-focus the camera on that spot. With such fast-moving subjects, you may need to press the shutter button the instant the subject noses into the viewfinder. You should certainly set your camera for fast-sequence shooting, but don't expect the camera to think or react for you. You still need to

perfectly time that first picture, because the acceleration of a determined sprinter or a hungry cheetah can defeat even the rapid-shooting settings of your camera.

Many short-lived moments—slices of life—that you can't even perceive can be magically captured using this shutter speed. With your camera set to 1/4000 second, your finger poised on the shutter release and your eyes peeled on your speedy subject, some infinitesimally brief and hitherto invisible actions are sure to be revealed.

With a shutter speed of 1/4000 second, the fastest shutter speed on many cameras, you can freeze even speeding motorcycles. Exposure at 1/4000 second, f/6.3.

1/2000 Second—the optimal fast shutter speed

If I could have only two shutter speeds on my camera, 1/2000 second is one I'd insist on. Why? Well, because as the heading here says—it's the optimal fast shutter speed. The reason it's my choice for best fast shutter speed is because it's so versatile. It's an extremely fast shutter speed that can stop the majority of high-speed photo subjects that appeal to most of us—things like wave runners, motorcycles, and Triple Crown winners.

Unlike 1/4000 and 1/8000 second, which both require very bright light, you can use 1/2000 second on a cloudy day at a moderate ISO of 400 and still get a good exposure. Altogether then, shooting at 1/2000 second lets you stop the motion of most subjects under a wide variety of lighting conditions at moderate ISOs (200 to 800), to give you exceptional quality images that delight your eye. That sounds optimal to me.

But there's more. At 1/2000 second, you can handhold even a 600mm telephoto lens and get sharp results. A shutter speed of 1/2000 second counteracts the picture blur that can result from the slight movement of handholding a camera with a long telephoto lens attached, so you don't need to use—and shouldn't use—*image stabilization* when shooting fast-moving

With a slightly slower shutter speed, such as 1/2000 second, you can use a smaller aperture for just a bit more depth of field. Here a sharp wake reinforces the effect of stopping the wave runner. Exposure at 1/2000 second, f/8.

subjects at this setting. Image stabilization is a fantastic technology, but in the fraction of a second it takes for the stabilization to lock in each time you focus, your subject could have slipped around the bend or have already made the winning goal.

And—just like when you open a bank account and get a free toaster—you get an added bonus when you choose 1/2000 second for your shutter speed. In this case, your bonus is having the option of using *selective focus* on a sunny day. Selective focus is the technique that relies on the shallow *depth of field* you obtain when you use a telephoto lens at a large aperture setting and focus on a nearby subject. Selective focus presents the foreground subject with emphasis because you see it sharply-focused against a very out-of-focus background. On a sunny day you achieve selective focus by using a low ISO, such as 100, a fairly large aperture, such as f/4, and a telephoto lens—all made possible by 1/2000 second.

1/1000 Second—a former record holder

Although it's been quite a while since 1/1000 second could claim the title of the world's fastest shutter speed, it did indeed hold the title at a singular time in history. This shutter speed—once a milestone innovation—began appearing in cameras about the time Jesse Owens took center stage at the 1936 Summer Olympics in Berlin. That newfangled 1/1000 second shutter speed meant that Owens, his contemporary Sea Biscuit, and all the other speed demons of the sports world could be stopped in their tracks.

Be careful when using 1/1000 second shutter speed. It can stop fast subjects but not super fast subjects. Some of my action pictures show a very slight blur because 1/1000 second didn't quite freeze the action. Exposure at 1/1000 second, f/8.

Even today, 1/1000 second stands out among action-stopping shutter speeds. While it may be part of the old guard, 1/1000 second is no slouch when it comes to stopping fast action. It's ideal for everyday school sports like football, track, soccer, baseball, and basketball. It's the slowest setting you can use to reliably stop a high school hurdler in mid-stride. And 1/1000 second is still the slowest shutter speed that eliminates the annoying picture blur caused by handholding a camera that's equipped with a non-stabilized 300, 400, or 500mm telephoto lens.

Equally important is that on a bright day, you can use 1/1000 second with a fairly low ISO of 100 or 200 and achieve noise-free images that shout quality. Another good point for 1/1000 second is that it lets you use a medium aperture such as f/8 or f/11. Using one of these mid-range apertures works to your advantage in two ways: it maximizes image quality for most lenses by giving you the sweet spot of optical image sharpness, and it also provides your pictures with a bit more depth of field to convey sharpness in critical areas.

Yet don't put too much trust in 1/1000 second. Athletes and machines are faster than ever and when they're zipping directly across the frame, you're better off notching the shutter speed up to 1/2000 or even 1/4000 second to be sure you freeze even small details like the spokes of a racing cyclist or the eyelets on the shoes of that hurdler.

1/500 Second—a nostalgic favorite

My first single-lens-reflex camera, purchased in the late 1960s, featured a top shutter speed of 1/500 second. Back then it was the fastest shutter speed on low-end, single-lens-reflex (SLR) cameras. I had no choice but to use it whenever faced with fast action, which is why it's my nostalgic favorite.

Although half a century ago 1/500 second was a mainstay for fast-action photography, now the only fast action you should use it for is of the family variety. If you think of this one as your backyard or family-action stopper, it will serve you

Fast shutter speeds aren't only for action. They also let you use large apertures to create selective focus favored by both nature and portrait photographers. Exposure at 1/1000 second, f/5.6.

well. You can count on 1/500 second to document the prowess of budding family athletes. Whether the kids are chasing the dog or jumping into the pool, swinging a bat at a T-ball game, leaping from a swing, or catching butterflies—1/500 second can fill your family album with exceptional stop-action shots. You'll probably find that about the time your kids graduate from grammar school is also the time for you to graduate from using 1/500 second. Teens run faster and jump higher: to keep up with them, set your shutter speed to 1/1000 second.

Where should you draw the limits when trying to stop fast action with 1/500 second? Let's take a look at what it can do. It can freeze joggers but not fast sprinters. It can stop weekend cross-country skiers but not downhill racers. It can halt swimmers in mid-stroke but not divers in mid-somersault as they plummet from a 3-meter board. It can render razor-sharp the pedals of your bicycling seven-year-old but not those of a cyclist sprinting to the finish line to complete the second leg of a triathlon.

But 1/500 second is Mr. Reliable when you use it with a telephoto zoom lens. As you'll soon find out, handholding a camera with a telephoto lens—even for photographs of still subjects like distant lighthouses—threatens your pictures with blur. That blur occurs because no matter how steady you are, you can't hold a camera perfectly still. But you can use a fast shutter speed like 1/500 second to counteract your slight movement. Whether you're using your telephoto to photograph squirrels comically dangling from your squirrel-proof bird feeder, a sailboat sliding in front of a setting sun, or the distant Statue of Liberty, set your shutter speed to 1/500 second and sharp pictures will follow.

Although 1/500 second may seem like a blast from the past, its past is based on the highest of pedigrees. It was first offered in the early 1930s on a Leica camera. Through the years, Leica's cameras and lenses have, like Apple's computer products, gathered a small but fanatical following of collectors. The long and storied history of Leica began in the 1920s and their innovations are still reflected in the digital age.

An experienced re-enactment photographer, Stewart Hecht favors a shutter speed of 1/500 second to reveal the powerful discharge of Civil War artillery. Exposure at 1/500 second, f/4. Photo © 2008 Stewart Hecht

1/250 Second—the all-purpose shutter speed

If this shutter speed wanted to be your only shutter speed, its campaign slogan would be: "1/250 Second - Set it and forget it." Although it may not come replete with a screw driver, tweezers, corkscrew, toothpick, saw, scissors, and bottle opener, 1/250 second functions like the Swiss army knife of shutter speeds.

When you don't know what sort of photo opportunities lie ahead, 1/250 second is the shutter speed you want to be packing. It's a great shutter speed for photographers on the prowl. Whether you're strolling along the streets of Paris or following your dog as he explores the paths winding through the local park, with this setting your camera can cover a variety of everyday and once-in-a-lifetime situations. Whether you decide to play paparazzo with street jugglers and mimes, catch tourists hanging off cable cars, or coax your kids into pausing for a playground portrait before they careen down the slide, 1/250 second fills all those needs and more.

It's not the first, nor even the second choice for action shots, but a shutter speed of 1/250 second is not powerless to stop moderate action. What kind of action can it stop? Let's say a jogger, a kayaker, kids tossing bread bits to the ducks, or an old dog lumbering after a tossed stick. But don't expect it to keep up with kids throwing

For casual photography, be it everyday action like a boy diving into a lake or a souvenir shot of a tourist landmark, a shutter speed of 1/250 second gives you both moderate depth of field and action-stopping ability.

Exposure at 1/250 second, f/8.

Exposure at 1/250 second, f/18.

fastballs or a recently-retired greyhound dashing after a Frisbee. Nor can 1/250 second freeze a speed skater streaking across the finish line or your teen flying off a snowboard ramp.

But it's the fastest shutter speed you'll likely use for the popular action technique of *panning*. Panning conveys motion by imparting selective blur to a picture. When panning, you take a picture while tracking the camera in synch with a moving subject like a bicyclist or wave runner—the camera movement blurs the background but shows the subject fairly sharp because you were tracking it. You can use 1/250 second when panning fast subjects like race cars, airplanes, speed boats—or me on my bicycle.

Another advantage of 1/250 second is its ability to deliver sharp pictures when you use a moderate *telephoto zoom lens* (say 70 to 200mm) to offset that camera shake I keep mentioning. It's a shutter speed often favored by your camera's *Program mode* because it allows a medium aperture choice, such as f/8 or f/11, thereby striking a balance between shutter speed and aperture. A shutter speed of 1/250 second is fast enough to stop moderate action and the medium aperture is small enough to provide sufficient depth of field to better assure the subject is sharp.

On many dSLR cameras, 1/250 second is the fastest shutter speed you can use with electronic flash. Use 1/250 second with flash outdoors on sunny days when photographing people. The light from the flash fills in harsh shadows under the eyes, nose, and lips to create more pleasing pictures. Compared to 1/60 and 1/125 second, 1/250 second in combination with your flash lets you use a larger aperture to throw the background out of focus and make your portrait subject stand out better.

Okay, here's your one-question quiz. What shutter speed should you set your camera to when you're not sure what photographic adventures await you?

1/125 Second—for the scenic shooter

The poor cousin of 1/250 second, 1/125 second is another all-purpose speed, one you can easily use on both sunny and cloudy days. The difference in how you use 1/250 and 1/125 is subtle but telling. At 1/125 second you've reached a threshold of sorts, the boundary where you are less concerned about stopping movement and more concerned about achieving greater depth of field to give your pictures overall sharpness.

The forte of 1/125 second may well be landscape photography on bright days. You see these pictures everywhere—those great postcard scenes you find at souvenir shops from the beaches at Waikiki to the Grand Canyon to Mount Katahdin in Maine. Calendars and travel books feature national parks and vistas of scenic byways. What do all those pictures have in common? Total photo sharpness. From foreground to background, everything is sharp. And how do you achieve such sharpness? Use a small aperture, such as f/16 or f/22, to create extensive depth of field. (Using a wide-angle lens, too, can help you achieve more depth of field). On a bright day, the companion aperture for 1/125 second will almost certainly be f/16 or f/22. But let the clouds roll in or the sun slip below the horizon and you may need a boost from a higher ISO setting to keep a good exposure at 1/125 second.

When the action is far away, like these athletes training on a beach, even 1/125 second can freeze it. Exposure at 1/125 second, f/11.

Although 1/125 second may be a benchwarmer in stop-action photography, it's still a first stringer on the action photography team. That's because it excels as the primary shutter speed to use when panning fast subjects. With your camera set to 1/125 second, you can pan a horse galloping to the finish line or a bicyclist racing downhill, and the results will show each subject sharply against a blurred background. And 1/125 second is another good shutter speed to use with flash, especially *fill flash* outdoors on an overcast day.

The exceptional image quality from the higher ISOs (800 to 1200) available on newer dSLR cameras has rejuvenated 1/125 second. Those higher ISO settings often let you use 1/125 second in dim locations like art museums, giving you the ability to get sharp pictures without a tripod.

A shutter speed of 1/125 second excels for sunny day landscape photos because you can use a small aperture such as f/16 to give your pictures front-to-back sharpness Exposure at 1/125 second, f/16.

You've read all the good things about 1/125 second, now let's go over a few of the cautions. It's too slow to stop anything faster than mall walkers, so consider yourself forewarned: when the toddlers head out for playtime, 1/125 second probably won't stop them. If your camera is set to *Auto exposure mode* or *Program mode*, keep your eye on the shutter speed when shooting moderate to fast moving subjects. If the shutter speed falls to 1/125 second, boost it back up to 1/250 second or higher by increasing the ISO or setting a larger aperture (smaller f-stop number).

And finally, know that 1/125 second can't eliminate the picture blur that results from handholding a telephoto lens with a focal length longer than 135mm—unless that lens incorporates image stabilization technology. If it does, then 1/125 second is probably a safe speed to get sharp pictures. If it doesn't, then put your camera and its telephoto lens on a tripod to insure sharp results—or use a faster shutter speed.

But let's not end on a negative note. Because when you're on a hiking trail—like the one that connects the coastal villages of Italy's Cinque Terre—and you pause to admire (and just maybe photograph) the splendorous vista, you'll be sharing that magnificent and magical moment with none other than your beloved travel companion, 1/125 second.

1/60 Second—when the light dims it shines

When the skies darken or you head indoors to make a portrait using the soft light of that big north-facing window, you'll likely find 1/60 second waving its hands for your attention. That's because this is the premier shutter speed for taking pictures in moderately dim light—you know, those times when you take off your sunglasses but don't yet need to turn on the lights.

Think of 1/60 second as both your cloudy day shutter speed and your indoor existing-light shutter speed. It's slow enough to let in sufficient light to make a good exposure on a dim day, but fast enough to let you conveniently (if you're careful) handhold the camera in most situations. In other words, when sunny old England reverts to its gloomy skies, 1/60 second will let you capture the magnificence of mansions and the melancholy of moors alike.

Would it be a bit mundane to suggest that 1/60 second functions like a reliable neighborhood handyman? The guy who's always available to clean out gutters and repair that broken tread on the stairs? Probably. So let's not underestimate 1/60 second's skills. A more appropriate comparison would be to suggest that 1/60 second

shines as the understudy who can step into a starring role when conditions seem a bit too dim and dreary for the faster shutter speeds that usually star in your pictures.

But there is one place where 1/60 second sheds the understudy role to become the star, and that's action photography. But not stop-action photography, because even a toddler can outrun 1/60 second. Instead, 1/60 second stars in the lead role of panning. And boy can it grab your eye and rivet your attention. You might not think being a single stop slower than 1/125 second would make much difference, but here it does. Use a shutter speed of 1/60 second when panning subjects of fast and moderate speeds and you can add an extra brush of breathtaking blur to your panning shots.

When the snow flies, I especially like 1/60 second for its ability to show the individual, crisp flakes of a snowstorm, as if a giant cereal box in the sky was pouring out its contents. A slower shutter speed like 1/15 second turns the flying flakes into streaks. Exposure at 1/60 second, f/8.

This shutter speed also excels for taking indoor portraits by window light. People look great when illuminated by soft, indirect (no harsh sunshine) window light. Eyes open wide and twinkle, skin tones radiate a healthy glow, and hair shines gently.

But for a handheld camera, 1/60 second brings an inherent risk of camera-shake blur. If you're extra steady or using an image-stabilized lens, you can probably still feel comfortable about getting reasonably sharp pictures while handholding the camera. But if you're truly quality conscious or like to enlarge your pictures to 8x10 inches or larger, then consider using a tripod or other support when you shoot at 1/60 second, especially if you're using a telephoto lens. Your pictures taken with a tripod will vibrate with sharpness and color.

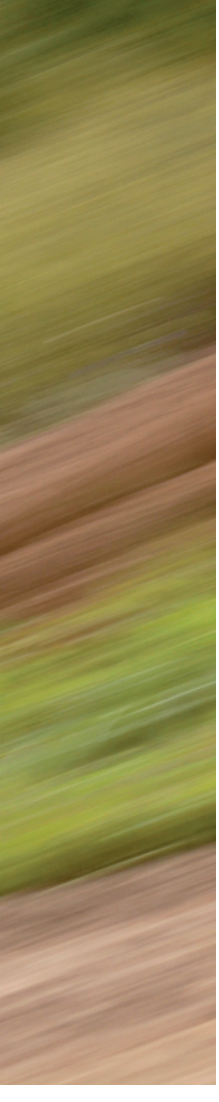
Ideal for portraits, soft, indirect window light often requires a slower shutter speed such as 1/60 second. If you are working without an image-stabilized lens, use a tripod or other support to obtain sharp pictures. Exposure at 1/60 second, f/6.7.

Whether I'm photographing a horse, a motorcycle, or a snowboarder, I love to pan the camera to capture moving subjects. Panning creates that wonderful speed-suggesting background blur. Exposure at 1/30 second, f/16.

1/30 Second—
the optimal slow shutter speed

Okay, remember when I said if I could only have two shutter speeds on my camera 1/2000 second would be one of them? Well, the other of my two speeds would be, I suppose, well, I guess it would have to be 1/30 second.

I say that with some hesitation, because 1/30 second is a tad slow for everyday photography. It's not as versatile as 1/60 second nor as fun to pal around with



as 1/125 second. And using it carries some risk—by now you know I'm talking potential picture blur caused from handholding the camera at a slow shutter speed. But even more than 1/60 second, 1/30 second is a shutter speed that greatly expands your picture-taking opportunities because it enables you to get *correct exposures* even in dim light.

Of course, you could use flash, but existing-light pictures are infinitely better. Natural light, because it conveys the ambience of a place, can be extremely attractive. Think of early morning light and how it pours through jewel-tinted windows of a cathedral. Or see how light falls softly through the open door of a barn, highlights an object inside, and then creates additional picture interest as it fades into darkness at the rear of the barn.

Unless you're one of those people who have developed their own personal biceps-building, image-stabilization improvement program (holding both arms straight out while clasping 16-ounce jars of Skippy peanut butter hasn't worked for me), using a 1/30 second shutter speed while handholding the camera can be quite risky. To successfully take existing-light pictures at 1/30 second, you need a support for your camera (such as a tripod, chair, or railing), or you need to take your pictures with an image-stabilized lens.

Perhaps the greater risk of blur comes from subtle, nearly imperceptible, movements of the subject and from any unwanted activity in the foreground or background of a scene. Posing by the window, your mother nods her head slightly; a bee brushes against a flower; the cat twitches its whiskers—though they are slight movements all—they're enough to create a distracting blur when you're shooting at 1/30 second. When this shutter setting is in use, a warning sign on the camera's LCD should flash: "Attention: If not used with proper care, 1/30 second may be hazardous to your picture health."

On the other side, a 1/30 second shutter speed can really boost your photo health when it's used for the action technique of panning. For those of us who pan neighbors mowing the lawn or dashing out in their jammies to retrieve the morning paper from the driveway, 1/30 second exaggerates the sense of motion and creates some excitement otherwise lacking from an event. If your neighbors are never outdoors, or voice an objection to your photo habits, be resourceful and take your camera further afield. Give 1/30 second a try for any subject moving slower than 30 miles per hour.

1/15 Second—where subjects blur themselves

You probably think of yourself as a fairly normal person with a fewer-than-normal number of idiosyncrasies—some appealing and some not. (The jury is still out on that bird seed in your hair trick you use to attract the backyard chickadees). But the moment you set your camera to 1/15 second, the normal person you think you know so well morphs into that wild and crazy thrill seeker, *Photo Guy*.

Blame it all on 1/15 second. It's a shutter speed that pushes you to the brink of wild and crazy blurriness. At 1/15 second and slower shutter speeds, your exposures begin to trade predictability for possibility. Your pictures start to make irresistible "vroom, vroom" sounds and, from that moment on, you'll be creatively blurring away as you bring all your action techniques into play. The results may surprise you.

Surprise was the essence of that old Monty Hall game show, *Let's Make a Deal*. If you remember, contestants faced three closed doors and had to blindly pick the prize behind one of them. You play a similar game of chance when you take photos at 1/15 second: the prize picture you think you took may well turn out to be terrific, or just tolerable, or really terrible. It's the possibility for surprises that make 1/15 second a shutter speed to choose for artistic expression.

At 1/15 second with the camera supported and focused on one spot, a fast-moving subject smears across the picture like a swoosh of finger paint. Slow-moving subjects or those with only some parts moving, a fast-fingered fiddler, for example, may reveal intriguing areas of sharpness mixed with blur. This targeted sharpness can be a haunting effect at 1/15 second. (Try this, too, at even slower shutter speeds. It's very compelling.)

This is a good shutter speed to use for panning slow-moving subjects like joggers and toddlers, but a word of caution: your photograph may seem carelessly out of focus if you don't track the subject accurately with your camera.

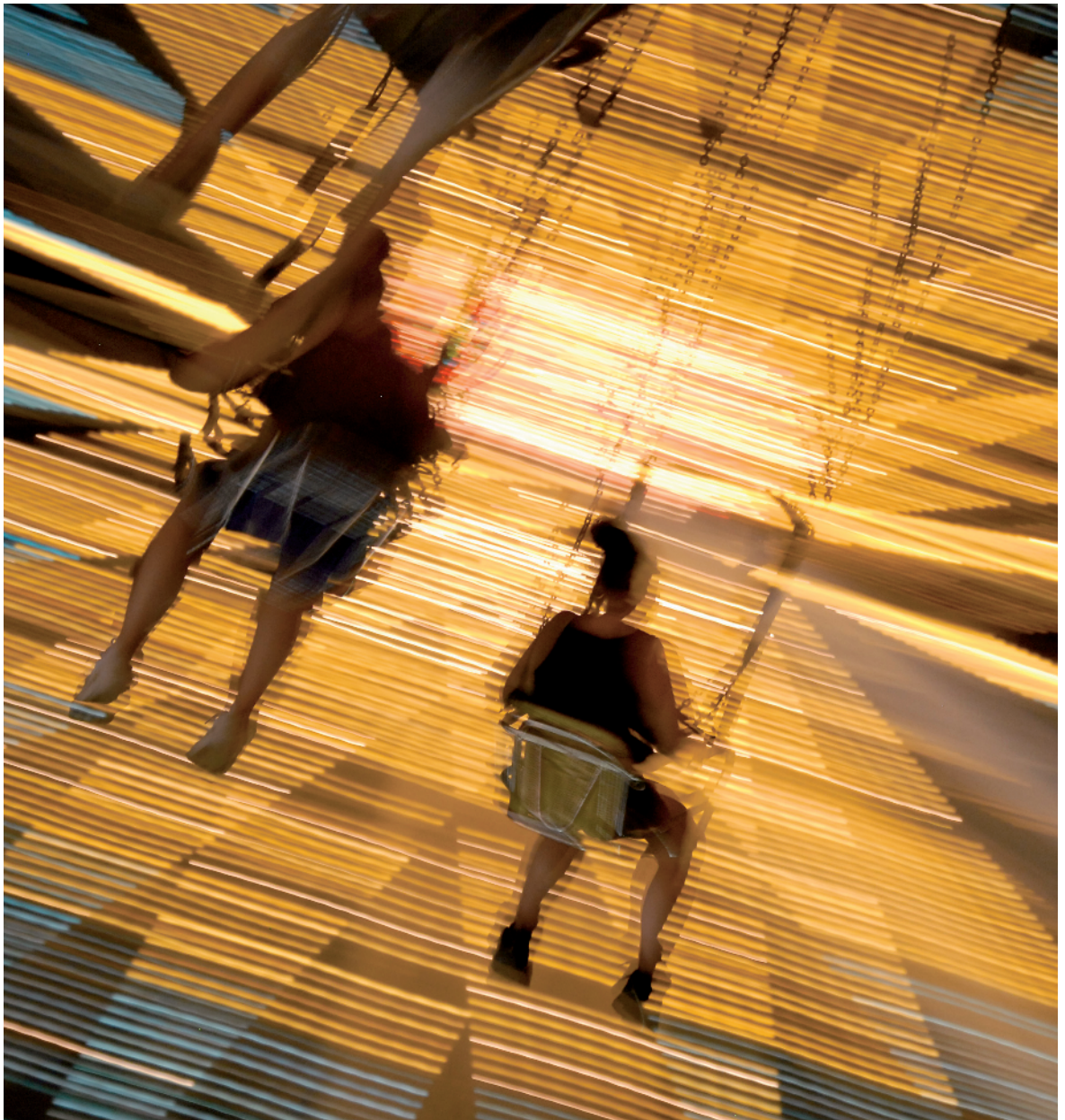
As daylight fades, 1/15 second begins to brighten. Think of a full moon rising through deep blue twilight. Make a study of rowboats tied up at a dock and see how they appear under the glow from a still bright evening sky. Watch as the barn on the ridge burnishes a deeper red under the fiery clouds of sunset.

When snow covers the ground, I like to photograph still lifes indoors by natural light. Since most of the subjects are close to the camera, I use very small apertures (f/22 for this picture) that often require a slower shutter speed, such as 1/15 second. Exposure at 1/15 second, f/22.

But whatever you do, bring out the tripod when you want your pictures to be extra sharp.

Sure, image stabilization technology may tempt you to leave the tripod behind. Sometimes you'll get away with it, but don't make a habit of trading in your tripod for image stabilization at slow shutter speeds. In churches and city halls—if you're without a tripod, support your camera on a pew or chair or railing. You may dodge the angry gods of camera shake for a while but eventually they'll give your camera an unwanted hug.

Carnivals offer bright lights and lots of motion. Here I panned the overhead swings as they seemed to fly into the Ferris wheel. Exposure at 1/15 second, f/5.



1/8 Second—the blessing of the blur

With your camera set to 1/8 second, you have two choices: find some moving subjects and stir up some serious impressionistic motion blur, or use a rock-steady tripod to make sharp renditions of immobile subjects.

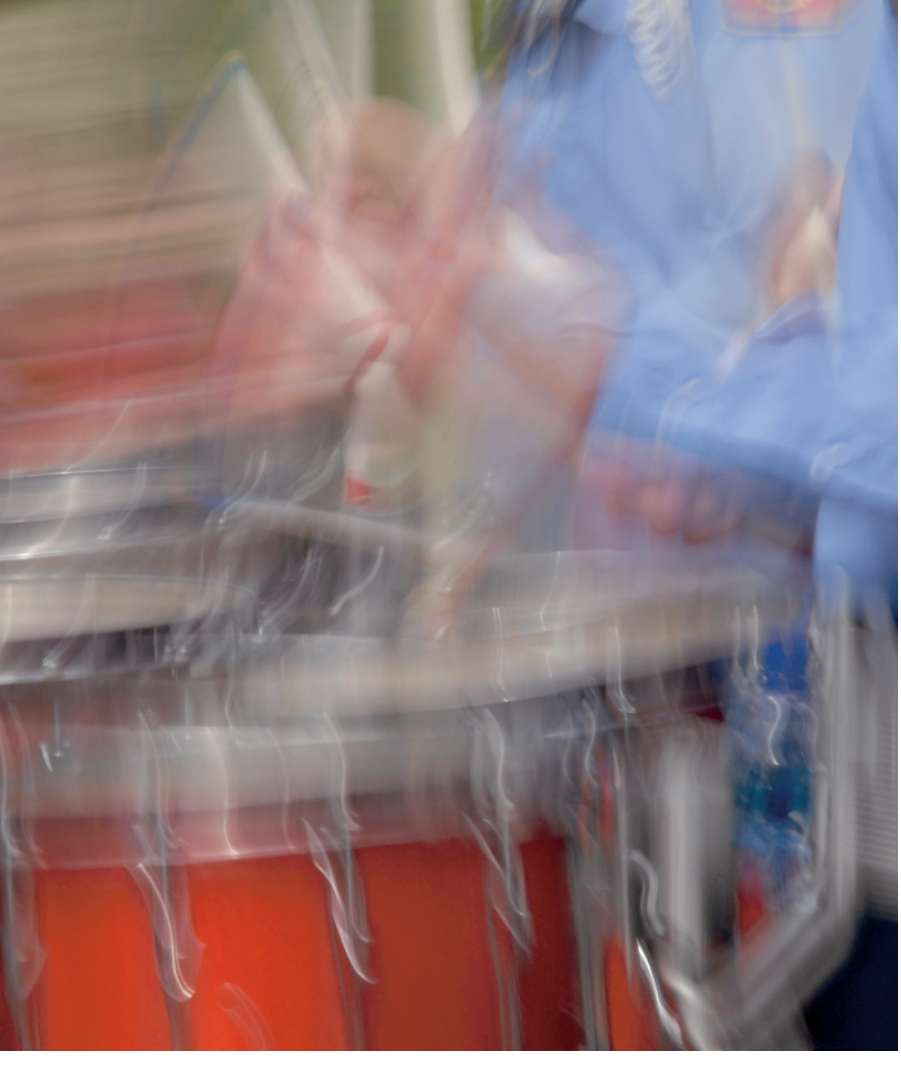
If a 1/15 second shutter speed introduced you to the world of motion blur, 1/8 second immerses you in it. At first you might think that the expression "motion blur" refers to panning with the camera—and it does. But not exclusively: you can also immobilize the camera, then use a 1/8 second exposure to let the subject's movement blur itself while keeping the rest of the picture sharp. This, then, is the

With the camera set to a shutter speed of 1/8 second, I used a picnic table as an impromptu tripod to keep the bored ride attendant sharp as the spinning merry-go-round blurred itself. Exposure at 1/8 second, f/8.

shutter speed that "softens" waterfalls and gives them that tasty cotton candy look. Against a sharply-focused background, dancers, jugglers, drummers, and pirouetting ice skaters sweep you up in a swirl of blur.

Panning at 1/8 second challenges your skill to smoothly track the camera in alignment with a subject: look through the viewfinder and lock onto the subject like you are an equatorial mount on an expensive telescope. If you succeed, your reward will be a rocketing rush of background blur that seems to push your sharp subject into warp speed.

Brrr. My friend Gary Whelpley took this picture of an ice fisherman at twilight while we were putting together a travel photo book on New York State's Finger Lakes. Exposure at 1/8 second, f/5.6. Photo © 2005 Gary Whelpley



Drummers, fiddlers, dancers, piano players, and many other performers blur attractively at slower shutter speeds. Exposure at 1/8 second, f/32.

A firm camera support (hint, hint—get a tripod) is a necessity for shooting pictures that show subject blur against a sharp background.

There's more to life for this shutter speed setting, of course, than a constant daze of blur. Choose 1/8 second when you have dim light and you need small apertures like f/22 to expand the narrow depth of field inherent when taking indoor still lifes, close-ups of flowers, or portraits of insects. When you're shooting outdoors, watch out for even tiny puffs of air. They may cause a flower to shiver and give you the dreaded blurs. Wait for absolute stillness, brace your subject with a stick, or shield it with an impromptu wind block such as your coat or your body before you take the picture.

This and other slow shutter speeds give even tripod shooters a challenge: to achieve sharpness, you need to master techniques that minimize camera vibrations. When trying to achieve sharp pictures of city skylines, rocky seashores, or twilight mountain ranges, you need to release the shutter without rocking the camera—not causing even the slightest nudge. This is especially crucial if you're using a telephoto lens. Whether you choose the self-timer, a remote release, or the delayed release mode, you need to reduce (best of all eliminate) the camera vibration that subtly destroys sharpness in a picture.

Like the drumming picture taken at 1/8 second, the slightly slower motion of dancing becomes a kinetic group callisthenic at 1/4 second. Exposure at 1/4 second, f/13.

1/4 Second—the poet laureate of motion pictures

The simple reality is that if you're using 1/4 second for your shutter speed, either the sun has set, storm clouds have swept in, or you've stumbled into a cave. Or, possibly, you've gone over to the dark side and attached a light-blocking *neutral density filter* so you can achieve the slow shutter speed necessary for extraordinary motion-blur effects. If 1/4 second intimidates you as much as it does me, remember this simple fact: it's about the same length of time it takes for your own shutter, the eyelid, to open and close.

The rewards of 1/4 second can be enormous. Many a waterfall photographer feels lucky to work in lighting conditions that allow the luxury of a 1/4-second exposure, because it softens the flow of falling water. If you master 1/4 second in your motion studies, then the title "Impresario of Impressionism" or "Master of the Abstract" could well belong to you. At 1/4 second, whether

you choose to pan or use another shutter speed technique, photographing motion becomes an act of faith.

Some technology infatuates still believe 1/4 second suffices for practical photography. They are the diehard and disillusioned handholders who make a last ditch effort at getting a sharp image by overtaxing their image stabilization system and assuming their most rigid statue-emulating poses. They'll have little luck unless Medusa reaches out and touches them an instant before they take the picture.

At 1/4 second, you're entering the world of time exposures. Technically all photos are time exposures, but those that use a significantly longer time than required for the normal daylight photo are considered true time exposures.

Using a tripod, you may still be doing some conventional photography at this level, such as photographing dim interiors or foggy coastal settings, but you've begun to face some creative and technical issues. Artificial lights can cause *white balance* and exposure accuracy problems, especially against dark surroundings.

If such issues don't faze you, come join the elite club of the few who venture into the dark. You'll discover darkness brings its own unique pleasures—especially for photographers in search of special effects. The extended darkness late in the year brings on a carnival of multicolored holiday lights. I drive around looking at displays and when I find a particularly impressive one, I sweep or swirl my camera across it to create joyous streaks of light.

As you explore the nether world of night photography and 1/4-second exposures, don't be surprised if you occasionally stumble because you are, after all, in the dark.

Light streaming through the windows let me use a 1/4-second shutter speed to capture the interior of this church high on Mt. Washington overlooking the Pittsburgh skyline. Yes, I used a tripod. Exposure at 1/4 second, f/5.6.

Although it may simply seem dark to you, to a camera collecting light for 1/2 second, late twilight paints the sky with intense oranges and blues that seem incredibly soothing. Exposure at 1/2 second, f/8.

Slow shutter speeds turn the many distinct braids of a waterfall into a smooth and enticing ribbon of white. To minimize camera vibration, I used the camera's selftimer and Exposure Delay mode; the delay mode minimizes vibration-induced blur by not opening the shutter until about two seconds after the mirror inside the camera flips up. Exposure at 1/2 second, f/25.

1/2 Second—
where writing with light becomes reality

What do you do with a half-second exposure? Maybe the best place to understand your photographic opportunities with 1/2 second is to begin by understanding (and appreciating) the origination of the word "photography." Photography is based on two Greek words, *photos* and *graphos*, which, when combined, mean writing with light. Technically, all photos are written with light reflected from a subject onto your camera's light-sensitive sensor.

But if you take the meaning of "writing with light" more literally you might begin to see some picture possibilities. At slower shutter speeds writing with light becomes a reality as moving light sources pen their paths across the camera's sensor. Car taillights leave pairs of bright red trails, fireworks stitch brilliant threads across the sky, and stars and satellites etch their silver routes against the dark. In somewhat brighter conditions of daylight and lamplight exposures, walking people become ghostlike at 1/2 second, cyclists dissolve beyond recognition, and speeding cars vanish without a trace.

At 1/2 second, expect the unexpected. You're on the verge of breaching the time barrier of 1 second. Even now the photo weft may begin to warp as the goblins of motion and physics squirm out between the pixels and initiate their antics. If you are photographing still subjects in dim light, prepare to boost the ISO to 400 or 800; you may want to turn on the camera's built-in noise reduction to reduce the annoying colored sprinkles of *electronic noise* that may spatter across your photos. (This problem is most obvious in the darker uniform areas of a picture.) The amount of noise increases at longer exposures and higher ISOs, and becomes prevalent in pictures made with snapshot cameras.

At 1/2 second shutter speed, that sturdy tripod becomes a fixture. If daylight begins to fade into darkness while you're taking pictures, work quickly before it disappears. Carry a miniature flashlight in your bag in case the sky turns pitch black before you finish; you may also want to add one of the hands-free, hiking headlamps to your equipment bag. Your camera manual explains how to activate the illumination setting for the LCD panel on your camera. In the dark you really don't want to have to guess which shutter speeds you're setting.

1 Second—
breaking the time barrier

One Mississippi, two Mississippi… At a shutter speed of one second you step into human time. Who can really understand what instantaneous events might occur within 1/8000, 1/1000, or even 1/100 second? But one second puts us into familiar everyday human time. Whether we're counting off by seconds for a game of hide-and-seek or watching the final moments of a football playoff game, we're comfortable with time intervals measured in seconds.

Vernazza, one of the small villages of Italy's Cinque Terra region, glows with lights as twilight deepens. Shooting in the RAW file format mode makes it easy for you to later decide whether you want the warm color balance of the village lights or the cool blues of twilight—or something in between. Exposure at 1 second, f/4.8.

For the camera, one second is both an eternity and a rarity. When was the last time you set your camera to one second? What was your subject and what other subjects might require a 1-second exposure?

The most attractive photos created in a second or two tend to be taken after dark. Fireworks look great. In a second or two or ten or twenty, multiple bursts of aerial explosions collectively form a bouquet of sparkling blooms. The bright lights of

At the south end of Zion National Park, the Virgin River runs between the road and the canyon walls, affording you easily-reached spectacular sunset landscapes. This photo was taken in early March with an exposure of 1 second at f/11. Exposure at 1 second, f/11.

Ferris wheels, carousels, and other carnival rides whirl round and round; in just a second your camera can record the brilliant colored circles and ellipses they're carving through the dark sky. Armed with Fourth of July sparklers or small flashlights, children can paint pictures or write messages in the dark that only a camera can capture.

Dedicated landscape photographers (some seen only when the sun hovers a little below and a little above the horizon) frequently play with exposures of one second and longer. Not for them the harsh burning orb of midday: they venture out only for the sensuous, subtle light and lengthening shadows that caress the worlds of twilight and dawn. (Shamelessly poetic, but I've run out of sports jargon.)

And shortly before dusk, another group of photographers who fancy exposures of 1 second and longer can be found gathering along the rims of vast canyons and on the terraces of city overlooks. (Because some of these scenic places get crowded, you can very quickly find yourself in competition for one of the prime spots to set up a tripod.)

You'll also find photographers who favor long shutter speeds indoors, too. Interiors like poorly-lit cathedrals and centuries-old landmark buildings present some great opportunities for capturing images of highly-detailed statues and ornately-painted ceilings. However, the mixed contrast of brilliant artificial lighting and dark recesses or corridors can mean a struggle to balance exposure and white balance. Both problems can be minimized by shooting in the RAW file format or using HDRI (*high dynamic range imaging*).

The new multi-exposure techniques of HDRI give you vastly improved photos that reveal details in the deepest shadows and brightest highlights. You take three to ten shots of the same scene, varying exposure each time—long exposures to show details in the dark areas, medium exposures for the mid-tones, short exposures for the bright areas—and then use software to combine the differently-exposed images into one final photograph that shows a full range of tonal detail.

And some very creative motion photographers struggle to capture meaningful photos as they reach the threshold of their art. At 1 second, time exposures of moving vehicles in the dark cut long swaths of light across the image, making abstract patterns. The technique of panning can be used to swirl images towards oblivion, while zooming can still be effective even as it becomes more experimental and difficult to render a recognizable image.

1 Minute—
reenact exposures of the "ancients"

Admittedly, using the word "ancients" to describe photographers of the 1860s may be a stretch, but there's no questioning they were among the pioneers of photography, an occupational field that expanded rapidly when short exposure times like one minute and less became practical. This era found many photographers documenting the broader world to the delight of everyday folk who could not afford long and expensive travel by train or steamer. Photographers often spent weeks traveling to their exotic destinations, hours setting up for a single shot, and several minutes preparing each glass plate for a single exposure.

As the decades slipped by, the time required for ordinary tasks shortened considerably. The time for long distance travel shrank from days to hours, for cooking from hours to minutes, for round-the-world communications from weeks to a few seconds, and for photographic exposures from minutes to fractions of a second. By the turn of the 21st century, a single minute seemed a lengthy duration during which much could be accomplished.

In our world of multi-tasking and one-minute managers, a sixty-second wait is annoying. You release the shutter, and as you begin your one-minute exposure, you start to worry about the time wasting away. Doubts and to-do lists assail you. Why haven't you painted the bedroom or finished that online business course? After 45 seconds goes by, you pull out your Spanish-language pocket guide and recite a few vocabulary words.

So why would you, today, want to use a whole minute or more to expose a single picture? It's because some worthwhile things, like the ripening of a pineapple or the blossoming of a tulip, still take time. Wait a minute or longer with your camera pointed at the right subject, and you might "grow" some pretty amazing photos. You could set up your camera in the back of the open van and aim at distant lightning forking across the night sky. Or you could turn the crashing late-twilight surf into a dreamy wash of color as a lighthouse beacon flashes in the background. You may just want to invoke the magic of an extra-long shutter speed to make moving subjects

Like a bucket placed under a slow-dripping faucet, a long exposure can gradually collect light where it seems there is none. In fact, if the exposure is long enough, it's possible to produce brightness out of darkness. This 30-second exposure in Antelope Slot Canyon shows that effect. Exposure at 30 seconds, f/14.

disappear from a scene. When such subjects are of average brightness and travel through the scene for a small fraction of the overall exposure, they simply are not recorded, as demonstrated in this photo of Grand Central Station.

You could be a desperate dying-light landscape photographer and hope for one more minute of the day's last gasp of light, the kind of light that coats the late evening with a precious shine that your camera intensifies.

More likely you're an astrophotographer aiming your tripod-mounted camera at the nighttime sky. With your ISO set to 400 or 800, you can catch the International Space Station as it streaks by and create a picture that shows it as a brightly curving arc reaching across the entire sky. You can turn the faint glow of Northern Lights into brightly shimmering curtains of light, and—if you wait until after midnight around August 11 every year—you can put in your pocket the sparking trails of falling stars from the Pleaides meteor shower.

One thing you're probably not doing with a few extra minutes is making portraits like the "ancients." They were thrilled when new and improved methods came along that shortened exposure times from the length of a sitcom to that of a commercial. When exposure times became short enough to make photo portraits practical, costs dropped and itinerant and store-based studio photographers became the rage. Everyday folk, for whom painted portraits were far too costly, found they could well afford photographic likenesses.

Here's Grand Central Station at rush hour. If you've ever doubted the camera's ability to see things you don't, here's proof. Hundreds if not thousands of people scurried through the station to catch their trains home during Herb Chong's six-minute exposure on a Tuesday at rush hour. To block enough light to allow such a long exposure time, he used a 10x neutral density filter. Exposure at six minutes, f/11. Photo © 2008 Herb Chong

8 Hours—
put your camera on the "C" shift

You'll not find a shutter speed setting for eight hours on most cameras. Instead you trigger the "Bulb" setting to start the exposure and then release it when you're done.

Make an eight-hour picture and you can say you used the same exposure time used for the first photograph ever taken. That picture was taken in France in 1826 by Joseph Nicéphore Niépce. On a sunny day he aimed his camera out a second story window. The subject of this momentous occasion—the first thing to ever be photographed—was none other than the roof of a pigeon house.

Niépce made his marthon exposure on a light-sensitive material that's a type of asphalt called bitumen of Judea. Sadly, the early promise of Niépce's first picture never blossomed. You could acquire a tan faster than he could take a picture, and—although Niépce experimented for the rest of his life—he never found a more practical material to replace his asphalt-based coating.

For what would you use an exposure time of 8 hours? Well, to track the rotational movement of the earth, of course. In other words, you'd make star trails. Point your camera at the North Star and keep the shutter open for several hours. You'll get concentric circles. Point it away from the North Star; now the light trails left by stars will be straighter. While your camera sits motionless, the earth relentlessly rotates and that's the movement that makes the stars above seem to travel across the sky.

A digital camera will add a large amount of noise for this length of exposure. If you want to make exposures of several hours, you're better off using a film camera. On a dark clear night, use a firm tripod, an ISO of 200, a 24 to 35mm wide-angle lens, an aperture setting of f/4 or f/5.6, set the exposure to B ("Bulb"), and keep the shutter locked open for anywhere from an hour to several hours. The longer the exposure time the longer the star trails will be in your picture.

Other than different forms of astrophotography, what else might require an exposure of several hours? I suppose anything that's in near-total darkness. I'll let you give it a try—I'm going to sleep.

This is a combination shot. I shot Maine's York Harbor lighthouse with my digital camera using an exposure of 2 seconds at f/8. Because digital cameras add a lot of noise during long exposures, I photographed the star trails using ISO 100 slide film: my exposure was about six hours at f/4. I scanned the film and combined the two images in Photoshop.

Mike Brown used three portable flash units placed within about two feet of a hummingbird feeder. With the units so close to the hummingbird, he achieved a short flash duration of approximately 1/15,000 second to freeze the rapid beat of the bird's wings. Exposure at 1/15,000 second, f/22.
Photo © 1998 Michael Brown

Nano Time—the hidden world of ultra-speed electronic flash

Four million light-years, one trillion dollars, 1/1,000,000 second shutter speed—numbers like these are incomprehensible. For centuries humans have wondered about the world moving around them, about the mechanics of movement, and especially about the muscle actions of humans and animals.

But human vision could neither freeze nor analyze the motion of anything moving faster than a slow jog. It was not until the 1870s that even the relatively slow motion of a galloping horse was stopped by the pioneering motion photography of Eadweard Muybridge. If humans were curious about how fast-moving natural things would look if they could be instantly frozen, they were even more curious about the artificial speed they were inventing. Explosives, trains, airplanes, all kinds of machines could all be improved if their minute movements—and speeds—could be analyzed and understood.

The first to achieve fame in this area was Harold Edgerton of MIT. In the 1930s, Dr. Edgerton improved electronic stroboscopic equipment to the point where it could be used to take pictures with exposures as short as a few millionths of a second. One of his most famous photographs shows a bullet, frozen in mid-air, exiting an apple.

In the following decades electronic flash became the constant companion of professional photographers. Later, as miniaturization gripped inventors, tiny flash units were built into camera bodies intended for both professional and amateur consumers.

With electronic flash, sights beyond the ability of the human eye are ours for the taking. Photographed at flash durations as short as 1/100,000 second, darting dragonflies, hyper-speed hummingbirds, speeding bullets, impacting water droplets, and a whole host of other subjects reveal their secrets to the camera. If you want to stop movements beyond the reach of a 1/8000 second shutter speed, you can do so by mastering the intricacies of electronic flash.