# Understanding Photography the Easy Way

# or

# Barnyard Banter About the Basics.

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**PART I** -- APERTURE & SHUTTER SPEED

How many cows pass through the gate

Let's begin with some simple, mental pictures of how aperture and shutter speed control exposure.

1. Imagine that a farmer has two fields, one to your left and one to your right. Imagine a fence dividing the two fields, with a gate in the middle of the fence.

2. One field is full of cows; the other field is empty, and the farmer wants to move a specified number of the cows to the empty field.

3. To allow the cows to reach the empty field, the farmer must open the gate. The wider he holds the gate open, the greater the number of cows passing through during any given time.

   Think of the width of the open gate as the aperture control of your camera: The wider the aperture (the wider the gate is held open), the greater the amount of light lighting passing through the lens during any given time.

4. The farmer has a second way to control the number of cows passing through the gate: The longer he holds the gate open, the greater the number of cows passing through at any given aperture (width of the opening).

   Think of the amount of time the gate is held open as the shutter speed on your camera. The slower the shutter speed, the greater the amount or light passing through the lens at any given aperture.

5. Isn't having the "correct" number of cows passing through the gate much the same as having the "correct" amount of light passing through the camera lens? By golly, it is!

To sum up: The farmer has two ways to control the number of cows passing through the gate: how wide did he hold the gate open, and how long did he hold it open. With your camera, the width of the aperture and the shutter speed controls the amount of light passing through the lens.

In reality, the aperture and shutter speed controls of a camera are two separate parts, but the idea of "how many cows get through the gate," gives us a mental picture of how aperture and shutter speed controls work together.

**PART II** -- DEPTH OF FIELD

When Elsie (the Borden Cow) looked at another cow about 20 feet away, the closer cows and the distant cows didn't appear sharp to her eye (unless she shifted her direct gaze to a different cow). Her eyes are O.K.; she was having an in-body depth of field experience.

REAL WORLD EXPLANATION

When you focus your camera lens (with SLR viewing, autofocus or "guess and by golly") for a distant subject, the lens will focus a sharp image on the film for that distance. In addition, some of the space on your side of the subject, and some of the space beyond the subject will also be in reasonably good focus. This space (from in front to behind) is called "depth of field." In most situations, we want as much depth of field as we can get.

The high-numbered f-stops (such as f22) yield MORE depth field than the lower-numbered f-stops (such as f4). This is for technical reasons beyond the scope of the present discussion.

How do you remember which gives the greatest depth of field, high- or low-numbered f-stops?

Bovine explanation : Elsie has a "never miss method"--she simply looks at the other cows the field:

1. If the gate in only opened a tiny bit, the cows are lined up "deep into the field" awaiting their turn to pass through the gate. Thus, Elsie sees that the cows are lined up deep in the field. ("Deep in the field" means lots of depth of field; clever little cows, huh.)

2. If the gate is flung wide open, the cows don't have to line up so far, so the depth of the cows in the field is reduced.

Real world explanation (well, kind of): Higher-numbered f-stops give greater depth of field than lower-numbered f-stops. To remember, think of the narrow gate opening and the cows lined up deep into the field. And when the gate is wide open, think of the cows not lined up so deep. (Okay, it's a hoky, slap-stick explanation, but if you can visualize it you'll never forget it.)

Depth of field and picture area

The smaller the picture area photographed, the lesser the depth of field. With extension tubes, for example, depth of field is in fractions of inches (or millimeters). How can you remember: Well--reaching for the bottom of the barrel--the cows can't line up as far in a miniature field.

Depth of field and focused distance--bovine explanation

When Elsie focused her eyes on a near cow, the closer and farther cows weren't in sharp focus. However, If Elsie focuses her eyes on a cow on the other side of the field, a greater number of cows appear sharp to her eye. (You can try this in the privacy of your own back yard by looking at near and far objects.) Thus, the farther the view, the greater the number of near and far cows that appear sharply to Elsie's eyes.

Depth of field and focused distance--real world explanation

1. For reasons beyond the scope of this simplified presentation, the wider the angle of the lens (the wider the view that the lens "sees"), the greater the depth field at any given f-stop. To remember, think of the Elsie's views of the near and far cows.

2. As for focused distance, the greater the focused distance, the wider the view that the lens sees (same as the above). To remember, think of Elsie's view of the cows at the other end of the field.

Depth of field, near and far--bovine explanation:

If Elmer (a very tall cow) looks at the fence, some of the cows of his side of the fence appear sharp. However, a greater number of cows in the background--on the other side of the fence--appear sharp. All Elmer knows is that when he focuses his eyes on something far away, He sees more sharpness in the background than in the foreground. Depth of field, near and far--real life explanation

If you focus your lens for infinity, one-third of the depth falls on your side of the focused distance (the ence) and about two thirds behind. However, is you get smaller and smaller picture areas, such as 1:1 (lifesize on film), the spread becomes half and half. For example, look at the close-up depth of field for the Nikon Close Outfit and the 80mm lens underwater. At f22, 4.7mm of the depth of field is on your side of the fence--5.1mm is on the other side.

**PART III** -- THE COWS MUNCH ON FILM SPEEDS

WHAT ARE FAST AND SLOW FILMS AND FILM SPEEDS?

Film speeds are numbers that indicate a particular film's sensitivity to light. The higher the film speed number, the "faster" the film; the lower the film speed number, the "slower" the film. Confused? Just relax; it will soon be easy as chewing your cud. It works like this:

1. A FAST FILM is highly sensitive to light, so less light must be "deposited" on the film for a proper exposure.

2. A SLOW FILM is less sensitive to light, so more light must be "deposited" on the film for a proper exposure.

Stop for a moment and try to guess how the cows are going to explain this one!

BOVINE EXPLANATION

1. Suppose the farmer seeded his field with FAST GRASS (fast film). Fast grass needs fewer "deposits" (of light) to make it grow (expose properly), so fewer cows (light rays) are needed to make the deposits. To reduce the number of cows making deposits, the farmer can: (a) only open the gate a tiny bit, or (b) only hold it open for a short time. In either case, fewer cows enter the field and make deposits.

2. Suppose the farmer seeded his field with SLOW GRASS (slow film). A greater number of deposits are needed to make slow grass grow. To increase the number of cows making deposits, the farmers can (a) open the gate wider, or (b) hold the gate open longer. In either case, more cows enter the field and make deposits.

BACK TO REAL LIFE

1. Because a FAST FILM requires a smaller deposit of light for an exposure, we can use a FASTER SHUTTER SPEED (or smaller aperture) to reduce the amount of light deposited on the film.

2. Because a SLOW FILM requires a larger deposit of light for an exposure, we can use a SLOWER SHUTTER SPEED (or a wider aperture) to increase the amount of light deposited on film.

3. To sum up, a fast film (high ISO number) requires a faster shutter speed (at any given f-stop) for an exposure. A slow film (low ISO number) requires a slower shutter speed at any given f-stop for an exposure.

ASA AND ISO FILM SPEEDS (BOTH USE THE SAME NUMBERS)

A film's sensitivity to light (how much light is required for an exposure) in indicated by numbers included in the name of the film (such Ektachrome 200 or Kodachrome 64). In the following two examples, assume that the f-stop will be unchanged.

1. Each time the film speed number is doubled (such as from 100 to 200), half as much light is needed for an exposure. We say the film is "faster" because a faster (doubled) shutter speed must be used. (Such as 30 to 60, or 60 to 125.)

2. Each time the film speed number is halved ( such as from 200 to 100), twice as much light is needed. We say the film is "slower" because a slower (halved) shutter speed must be used, such as from 125 to 60, or 60 to 30.

FAST AND SLOW SPEEDS--U/W EXAMPLE

Imagine that you are beneath 60 feet of clear, tropical water. Your exposure meter indicates that f5.6 at 1/60 with ISO 100 film will let in enough light for a sunlight exposure. However, If you used ISO 200 film (which requires half as much light), you could use the faster shutter speed of 1/125 second--thus, ISO 200 is a "faster" speed film than ISO 100. Conversely, ISO 100 film is a "slower" film than ISO 200 because you can slow the shutter speed back to 1/60 second.

FILM SPEEDS AND THE AGE OF THE COW

ASA (American Standards Association) is an older organization; ISO (International Standards Organization) is a newer organization. Different cows use these film speed ratings (numbers) as follows:

1. Old cows often say "ASA" because that's the term they learned in the older books.

2. Young cows usually say "ISO" because that's the latest terminology, and they wanna be "hep" (or whatever young cows say).

3. Insecure cows use "ASA" and "ISO" interchangeably so they have a 50/50 chance of being correct.

4. Smart-ass cows combine the terms as "ASA/ISO," so they are correct all the time. (I learned that from a cow named Dilbert.)

**COWS PART IV**--PUSHING AND PULLING FILM

After Part III, "The Cows Munch on Film Speeds," some cow-lovers asked them to comment of pushing and pulling film speeds. As this is a completely new topic for the cows, they had to reach to the bottom of their haystack for their explanation.

*REAL LIFE VERSION (Let's start with sanity):*

An ISO 100 film is designed for exposure at ISO, its rated film speed.But what if you wanted to shoot at ISO 200, but only had ISO 100 film?

YOU CAN "PUSH" THE ISO 100 FILM TO ISO 200.

Pushing film is easy:

(1) Load the camera with ISO 100 film.

(2) Pretend the film is ISO 200 film and expose it at ISO 200.

(3) The film will be "pushed up " to ISO 200 by a longer development time during processing.

YOU CAN "PULL" THE FILM BACK TO ISO 50.

Pulling film is easy:

(1) You accidentally shot ISO 100 film at ISO 50, but all is not lost!

(2) The film can be "pulled back" to ISO 50 by a shorter development time during processing.

REASONS FOR PUSHING AND PULLING FILM

The cows hope and pray that other list members will add their experiences and opinions to this discussion. This is beyond their bovine brains.

NOTES:

(1) When pushing or pulling film, the new film speed is called an Exposure Index (EI). It replaces the normal ISO film speed, but who really cares to know this.

(2) I'm not a darkroom person, but I assume that a custom film lab can make the push/pull adjustment. (List members may wish to add to this.)

(3) You must tell the film developer what speed (EI) the film was shot at.

(4) I used ISO 100 film as the base for this example; the same ideas apply to films with other film speeds.

*BOVINE VERSION--FIRST THE VOCABULARY:*

| | | |
|---|---|---|
| Speed | = | Elmer's normal gait (normal ISO rating). |
| Pushed | = | Elmer speeds up (ISO rating is increased). |
| Pulled | = | Elmer slows down (ISO rating is reduced). |
| Gate | = | the camera shutter (the duration of its opening varies with Elmer's speed, assuming that the width of the opening stays the same |

Elmer, an anxious young bull, always walks at the same speed: 100 steps a minute. But when he saw Elsie prancing around in the next field, his speed increased to 200 steps a minutes. He was "PUSHED" by his love for Elsie. He can now reach her in half the time because he is a "faster" bull. The gate between the fields can now be opened for only half the normal time to let him pass through.

Suddenly--without warning--Elmer sees Elsie's mother (a big, mean cow from Wanker County)! His pace immediately slows to 50 steps a minute. He is "PULLED BACK" by his fear of Elsie's mother. It will now take him twice as much time to reach Elsie because he is now a "slower" bull. The gate must now be held open for twice as long as normal.

In each of the above bovine situations, the gatekeeper needs to know if Elmer is being "pushed" or "pulled," so he or she knows how long to hold the gate open.

**COWS, PART V** RELATIONSHIPS BETWEEN APERTURES, SHUTTER SPEEDS AND FILM SPEEDS GIVE US "THE GRAND TRADE-OFF."

QUICKIE REVIEW:

1. Each higher-numbered full f-stop (such as going from f8 to f11) admits half as much light at any given shutter speed. Each lower-numbered full f-stop (such as from f11 back to f8) admits twice as much light. (I said "full" because there are some in-between stops, such as f4.5 or f9.)

2. Each higher-numbered consecutive shutter speed admits half as much light (such as going from 1/30 to 1/60). Each lower-numbered shutter speed (going back from 1/60 to 1/30) doubles the amount of light admitted.

3. Each higher-numbered (doubled) ISO rating means that the film needs half as much light for an exposure (ISO 200 needs half as much light as ISO 100). Each lower-numbered (halved) ISO rating requires twice as much light (as from 200 back to 100).

BIG THOUGHTS ABOUT RELATIONSHIPS

Notice how are most changes are either "double or half? (Yeah, going from 60 to 125 fudges it a little and going from ISO 64 to 100 is still within one-third of an f-stop. But what the heck, you got the idea ;)

1. Each change in f-stop, shutter speed or ISO either admits or requires either twice as much or half as much light.

2. The changes in apertures, shutter speeds and film speeds are related because the changes are "equal." This leads us to The Grand Trade-off.

*THE GRAND TRADE-OFF: BOVINE EXPLANATION*

To help visualize THE GRAND TRADE-OFF, think about The Grand Trade-off from Elmer's point of view:

On any given afternoon, Elmer can nap, graze or socialize with Elsie. Given that he has only so much daylight and time during the afternoon, Elmer must make some choices:

1. If Elmer chooses to nap, he must give up some grazing and socializing time. (Calves love this because they can play "king of the mountain" on his rotund belly.)

2. If Elmer chooses to graze, he must give up some napping and socializing time. (Elsie loves this because it keeps Elmer occupied.)

3. If Elmer chooses to socialize, he ends up tired and hungry. (And so does Elsie.)

(There are outside factors that influence Elmer's choice of activities--such as: how many hours of light does he have, how good is the grass and how fast can Elsie run. Sorry, Elmer. Nobody said making decisions was easy.)

*REAL-LIFE LOOK AT THE GRAND TRADE-OFF*

There are three areas in which you may strive to gain an advantage:

1. You may want low film speeds for fine grain and good color.

2. You may want small apertures (high f-numbers) for more depth of field.

3. You may want fast shutter speeds to stop the action.

Any choice you make has a price which you will pay in one or more of the other areas: For example, a slower ISO film speed will force you to use a wider aperture, slower shutter speed or both. To summarize:

1. A slow film speed gives you fine grain and color, but you lose either depth of field, the ability to stop action or both.

2. Small apertures give you better depth of field, but at the cost of increased grain, the ability to stop fast action or both.

3. Fast shutter speeds let you stop the action, but at the cost of more grain, less depth of field or both.

There are outside factors that influence your decision, such as how much light do you have--sun or strobe--how fast are your subjects moving, and do you have both near and far subjects. As Elmer would say, "Sorry, Charlie; there ain't no such thing as a free bail of hay, or a roll in it.")

HOW TO REMEMBER THE GRAND TRADE-OFF

Compare yourself with Elmer. Elmer's choices were napping, grazing or socializing--all easy to remember. Your choices are: fine grain, stop the action or depth of field--also easy to remember. Your choice depends on how you wish to utilize the light you have to take the exposure. (Just think "GAD."

**COWS PART VI** -- WIDE-ANGLE AND TELEPHOTO LENSES

The designations "wide-angle" and "telephoto" are determined by focal length. Lenses with short focal lengths, such as a 15mm lens for a 35mmcamera, are wide-angle lenses. Lenses with long focal lengths, such asa 100mm lens for a 35mm camera, are telephoto lenses.

*BOVINE EXPLANATION*

Imagine that Elsie has her rump pressed firmly against the back fence, and that she is looking out through the gate. If the distance from the fence to the gate is short, Elsie's view through the gate (of the other field) is quite broad. If the distance from the fence to the gate is long, Elsie's view of the other field is quite narrow. Thus, a short fence-to-gate distance gives her a wide view; a long fence-to-gate distance gives her a narrow view.

*REAL WORLD EXPLANATION*

(1) Think of the back fence as the film.

(2) Think of the gate as the aperture.

(3) Think of the fence-to-gate distance as the focal length.

(4) Think of "angle of view" as the width of the view Elsie sees through the gate.

The shorter the focal length, the wider the angle of view the lens sees. The longer the focal length, the narrower the angle of view thelens sees. A 15mm lens sees a wide angle of view, a 100mm lens sees a narrow, telephoto angle of view.

How can you remember this stuff: easy--just think of Elsie backed up against the fence and looking Through the gate, and then imagine some different Elsie-to-gate distances.

**QUESTION:** Wouldn't the width of the gate opening also affect the width of the view?

**ANSWER:** While changes in the width of the aperture might make itsy-bitsy changes in the angle of view a lens sees, the curvature of the lens elements negates this problem.

**JACOBY EYEBALL ANTICS**

Dick Jacoby uses a different example to illustrate wide-angle and telephoto lenses. To paraphrase Dick:

(1) Make a large circle with your thumb and first finger tip. PRETEND THE OPENING IS THE APERTURE OF A LENS.

(2) Hold your hand in front of one eye and look through the opening. PRETEND THAT YOUR EYE IS THE FILM.

(3) PRETEND THAT YOUR EYE-TO HAND DISTANCE IS THE FOCAL LENGTH.

(4) If you hold your hand close to your eye (a short focal length) you will see a wider view than if you hold your hand farther from your eye (a longer focal length).

*WHAT IS A "NORMAL" LENS*

A "normal lens" is somewhere between wide-angle and telephoto lenses. Topside, a 50mm lens for a 35mm camera is considered "normal" because it approximates the view of the human eye. Underwater (where a 35mm lens acts like a 47mm lens) let's say that the 35mm lens is a "normal" lens for underwater photography. Close enough for bovine work.

*DEPTH OF FIELD AGAIN*

Reminder: At any given focused distance and aperture--the wider the angle of the lens--the greater the depth of field. Why? Because Elmer says so. (Actually, the explanation is beyond the scope of my simplistic approach.)

**PT VII** -- ALL EXPOSURE METERS ARE MALE

Ladies, let me explain exposure meters in words you will all instinctively understand: All exposure meters are male:

(1) They won't stop and ask for directions.

(2) They have only one thing on their minds.

(3) If they don't get what they want, they cheat.

HOW EXPOSURE METERS “THINK”

Let's KISS (keep it super simple). Let's think in terms of black & white photography--you aim your exposure meter at the subject, and the meter gives you an exposure reading (often the f-stop for a given shutter speed).

(1) An exposure meter only measures what it sees, and it only sees what you aim it at. It doesn't stop and ask you for aiming directions.

(2) An exposure meter only has one thing on it's mind--it lusts for an average shade of gray (called 18% gray). An exposure meter only has one thing on its mind: it wants the entire world to be gray.

(3) If an exposure meter sees another shade--such as black or white—it will cheat and turn that shade to gray. Ladies, you can stop here if you wish--you have the idea.

WHY ARE ALL THE COWS GRAY

It was a warm, sunny day, and the farmer decided to photograph some of his cows. He set his camera's built-in metering for "spot metering." (The spot meter setting tells his exposure meter to only look at a small area in the middle of the picture.)

His first model was Elsie, only white cow in the herd. His trusty spot metering system saw only Elsie's bright, white body and zappo—the farmer had his first picture.

Elmer, the black bull was his second next subject. The spot meter saw his black body, and zappo again--the farmer had his second picture.

Dlberta, the gray cow, was his last subject -- yeah, another zappo and another picture.

When the pictures were processed, the farmer stared in utter disbelief. He'd spent a zillion bucks to buy a farmer-proof, fully-automatic camera, and his pictures all looked the same. All three of the cows were gray. Why? It's because the exposure meter lusted for gray and cheated. (Hey, meters are male.)

AIM YOUR METER AT A GRAY COW

The moral of the story is : If you want your white cows to be white, your black cows to be black, and your gray cows to be gray, aim your exposure meter at a gray cow.

WHAT'S GRAY UNDERWATER

(1) Try aiming at the mid-water background rather than someone's black wetsuit and BC, or a dark shadow area of the reef or wall.

(2) With upward silhouettes aim , not directly at it.

(3) With a spot meter, try aiming off the palm of your hand (held so the sun strikes it directly--not shaded by your head) and then open one f-stop (lower f-number) to keep your hand from going gray.

PSST! WANNA TEST YOUR EXPOSURE METER?

You can use this test with any in-camera or hand-held exposure meter.

(1) Set the ISO and film speed for 60.

(2) Stand so the unobscured sun is behind you.

(3) Aim the camera or meter at green grass.

(4) Depress the shutter speed release partway and look in theviewfinder.

(5) Nikonos V "60"should appear in the viewfinder.

(6) Housed camera: analog scale should read "zero."

(7) Hand-held meter should read f16 and ISO 64 and 1/60 second.

You can also use the palm of your hand as a test target. Hold your palm a few inches from the lens or meter. Tilt your palm so it faces the sun so direct sunlight strikes your unshaded palm--you donít need to focus. The metered f-stop should read f22 (not f16).

You can adjust the ISO setting so the meter reads f16 for grass or f22 for your palm. This ìadjustedî ISO setting is your ìEIî (exposure index) and can be used in place of the ISO speed of the film.

PSST? WANNA CHECK THE PROCESSING, EASILY.

(1) Find a scenic view with a vary of shades and colors--one that exposes properly at f16 and the ISO closest to your shutter speed is ideal.

(2) With camera on a tripod, shoot 36 shots on E-6 color slide film.

(3) Each time you have film processed at a resort, or dive boat, have the processor snip off a few inches of this test roll and include it in the processing.

(4) After each daily processing run, you have a standard scene for comparing variations in processing from day to day.