AQHA

eBooks

Structure in Detail

Table of Contents

Illustrations by Dr. Robin Peterson

Introduction

In evaluating conformation, a horse's overall balance ranks first in order of importance. But understanding the structural framework – bone, muscle and tendon – making up that overall balance is a must. The two complete each other.

"You have to train yourself to evaluate conformation," says Dr. Jerry Black, veterinarian and director of Colorado State University's Equine Reproduction Laboratory and the Equine Sciences Teaching and Research Center.

"What we often do is evaluate characteristics that we're excited about, and that might be color or type. There are things that are unique among different breeds and certainly among Quarter Horses we have conformational differences depending on discipline.

"But there are commonalities, and good conformation is good conformation."

Dr. Black considers two things when he looks at the parts of a horse's structural conformation: "I look for conformation that will promote soundness and durability. I ask, 'How long is he going to stay sound doing what he does? Is he going to have a fulfilling career and is his conformation not going to hinder him? Or will he have pathological problems from the beginning?' "

AQHA and World Conformation Horse Association judge Tim Finkenbinder agrees, adding, "As good horsemen, evaluating structural correctness is not just identifying a problem, saying 'That's not good' and walking away. You have to also use your common sense, asking how it fits with the overall picture of the horse. You might ask yourself, is that problem something that could change, or will it never change?"

For example, it's the difference between looking at a yearling, noticing that he's croup-high, and understanding that he could grow out of that, versus looking at a yearling, noticing that he's straight in his

shoulder, and knowing that will never change and will more than likely create soundness issues.

"Good conformation is fact, not opinion," Tim says. "And the nice thing about promoting 'form to function' is that when something's structured properly, it's beautiful. We like to look at a beautiful animal, but without balance and structural correctness, it's not pretty."

In this book, our two experts will walk through specific parts of the horse, illustrating structural correctness and common abnormalities. The goal: to add to your toolbox of resources in training yourself to evaluate horse conformation.

ABOUT THE SOURCES

Originally from central Illinois, **Tim Finkenbinder** has been training and fitting halter horses for more than 25 years and has multiple world champions and All American Quarter Horse Congress successes to his credit. He also serves on the World Conformation Horse Association executive committee and is the vice chair of its judges' committee. He owns and operates Finkenbinder Ranch in Collinsville, Texas, and has one son, Trent.

A graduate of Colorado State University veterinary school, **Dr. Jerry Black** co-founded California's Pioneer Equine Hospital, which he operated for more than 30 years. With wife Melinda, in 1995 he founded Valley Oak Ranch, a cutting and reining breeding farm. A past president of the American Association of Equine Practitioners, Dr. Black serves as chairman of the board of trustees for the American Horse Council and previously completed a six-year term on the National Cutting Horse Association executive board. In 2010, he returned to CSU, where he is director of the Equine Reproduction Laboratory and the Equine Sciences Teaching and Research Center. Avid cutters, the Blacks have one son, Brandon.

Illustrator and veterinarian **Dr. Robin Peterson** pulls from her large and small animal veterinary experience to lend anatomical detail and correctness to the artistic beauty of her medical illustrations. Based in the Pacific Northwest, she is also in demand as a natural science illustrator and animal portraitist. Her website is *www.fernwoodstudio.com.*

Part 1: The Shoulder

"In my experience, a lot of problems you notice down low actually start up high," Tim Finkenbinder says, "and the shoulder is a great place to look first, because how the shoulder is set into a horse affects the length of back, the set of the neck, the angle of the pastern and so on. It dictates a lot of things."

Dr. Jerry Black ticks off three factors to consider in evaluating the shoulder: angle, length and musculature.

"Horses with a good, sloping angle to the shoulder, a good length to the shoulder and an appropriate amount of muscling have a good stride length," he points out. "They can naturally advance that leg forward and endure the stresses of whatever their activity is."

Angle

Looking at the angle formed between the line of the shoulder and a line parallel to the ground, the ideal angle should range around 45 degrees or greater.

Both men agree that the No.1 fault in a shoulder is for it to be too straight or have too little angle. It's more common to see a too-straight shoulder in Quarter Horses than a shoulder with too much slope.

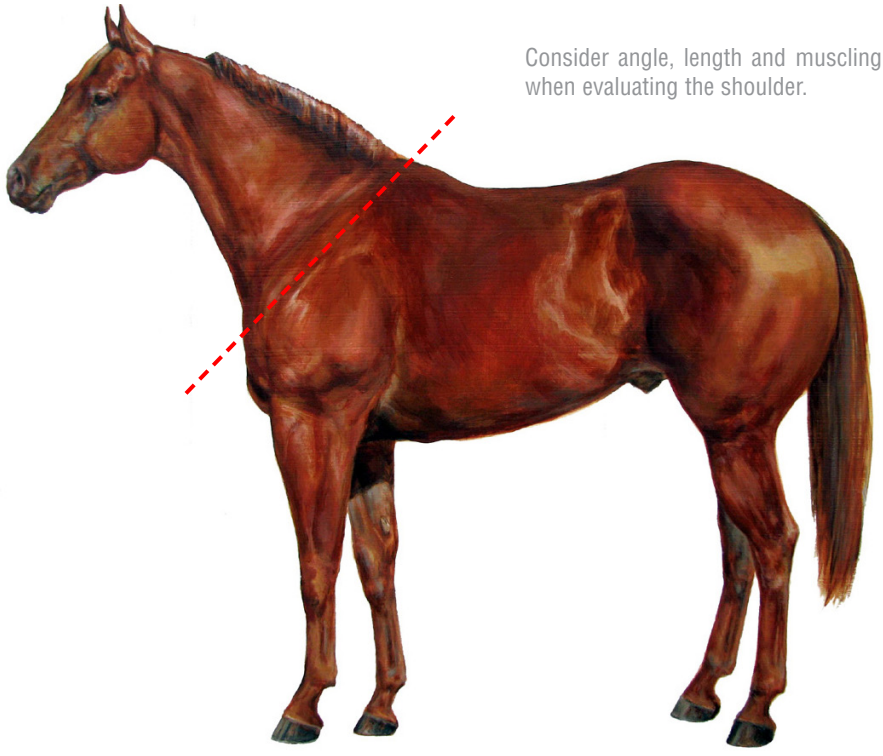
"The horse carries 60-70 percent of its body weight on the front end," Tim points out. "When you straighten that shoulder, it throws his balance off and puts even more weight on the front."

Shoulder angle corresponds to the pastern angle: a straight- shouldered horse will also be too straight in his pasterns.

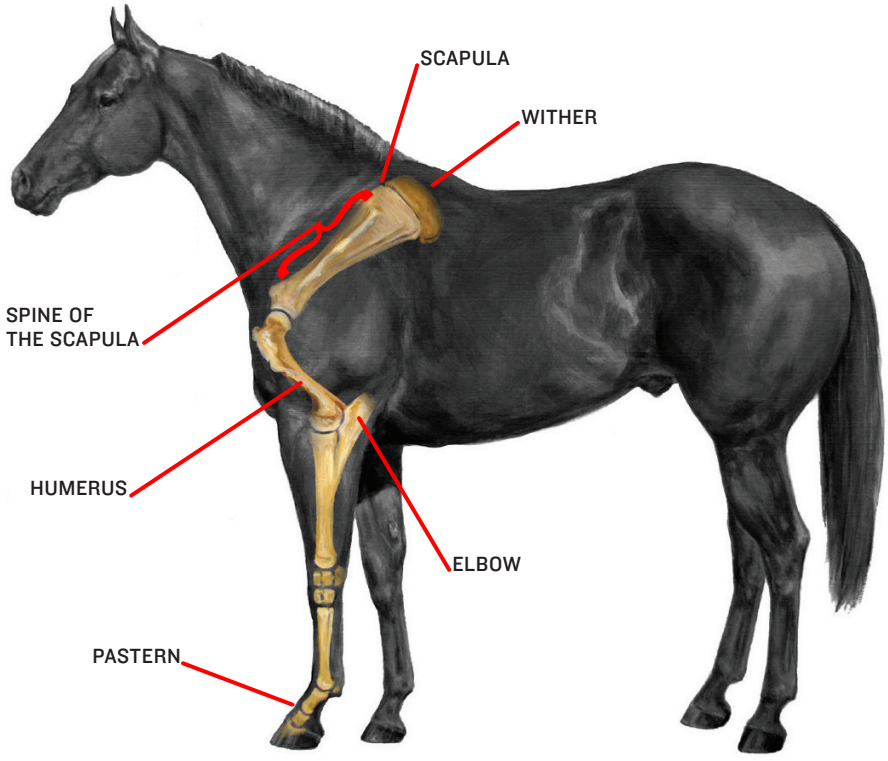
"With less angle in the front leg," Tim says, "the limb can't absorb the concussion of that body weight coming down."

The pressure is compounded when you add a rider.

It also makes that horse less comfortable to ride, adds Dr. Black,



Consider angle, length and muscling when evaluating the shoulder.



Rule SHW350. The purpose of the (halter) class is to preserve American Quarter Horse type by selecting well-mannered individuals in the order of their resemblance to the breed ideal and that are the most positive combination of balance, structural correctness, and movement with appropriate breed and sex characteristics and adequate muscling.

-AQHA Official Handbook of Rules and Regulations

because "they pound the ground more, as the cowboys say.

"A horse with good angulation in his shoulder and pastern has a greater ability to drop his fetlock and absorb concussion through the mechanism of his tendons and ligaments."

Length

"I train my eye to look at the top of the shoulder, the scapula (or the wither), and follow the indentation of the shoulder muscles along the spine of the scapula, all the way down to the point of the shoulder, seeing that length," says Dr. Black.

"It's a mistake to focus only on the angle of the shoulder, and forget to evaluate length. The length of shoulder also dictates how far a horse is able to advance his leg forward.

"Horses with a longer shoulder also tend to have a corresponding long length to the humerus, in the arm itself from the shoulder to the elbow," he adds. "That lends strength to the horse's ability to set that stride in motion as well as contributing to the actual length of stride.

"A horse with a short humerus tends to have a choppy gait."

Muscle

Without appropriate muscling, a shoulder lacks strength to perform and endure.

"In our Quarter Horses, we expect those muscles in the shoulder to be full and well-developed," Dr. Black says. "In fact, that is typical of the breed.

"In my experience, you tend to see poorer shoulder muscling in horses that are finer boned, and they are poorly proportioned overall. Unless there's a shoulder injury involved."

You can have too much muscle in the shoulder.

"Horses with genetically shortened dorsal spinous processes of the thoracic vertebrae of the withers, or that have excessive muscling of the shoulder and neck region, tend to have what horsemen call 'mutton withers,' " Dr. Black explains. "This low and thick conformation decreases the definition of the withers that helps to anchor a saddle."

"Mutton withers are often first apparent in a horse's topline," Tim adds, "and the horse is often higher hipped. He'll be much more shallow-hearted than a horse with the good, prominent wither that we want."

He sums up the ideal: "A shoulder set in at 45 degrees, with good length, a good prominent wither, and a horse deep in the heart girth – if you have all those things, you're going to have a very functional, usable and pretty animal."

Part 2: The Knee

The equine front limb is designed to bear 60-70 percent of the horse's weight and to absorb concussion of that weight bearing downward and meeting the ground as the horse moves. When you evaluate front limb structure, you evaluate its ability to do those things.

The first thing to get in your mind when you evaluate the front limb from the side is what the ideal should look like. You need to visualize the skeleton underneath – it will make you less likely to be thrown off by body conditioning or a poor set-up in your evaluation.

On a horse standing balanced on level ground, imagine a plumb line from the middle of the scapula (midway between the crest of the scapula and the point of the shoulder) that runs straight down to the ground. The line should go straight through the column of bone – bisecting the forearm (radius), knee (carpus) and cannon bone – exiting at the base of the pastern to hit the ground just touching the bulb of the heel. That structure gives the limb the strength and flexibility necessary to absorb

SHAKY KNEES

A horse can shake at the knees for a number of reasons.

"When a horse shakes at the knees, he's not functionally stabilizing the knees into place – it's usually most evident at rest when standing," explains Dr. Black. "He may lack muscle strength or be fatigued. Often he'll be a bit over at the knees.

"You see it much more in young horses: They are immature, growing rapidly, and their skeletal growth is occurring faster than muscle strength. Most will grow out of the shakiness. You certainly see it more often in heavier-muscled young horses than others."

Tim adds: "In judging seminars, I always say your toleration level for shaky knees needs to go down as the horse gets older. Depending on the individual, you can tolerate a little with a foal: If you cannot see a conformational problem behind it, he might be tired that day or be in a growth spurt.

"But everything age 2 and older should stand sound and square with no movement in his knees."

If you see it in an older horse, "you have to consider that the problem is genetic," Dr. Black adds. "And you would want to breed away from it."

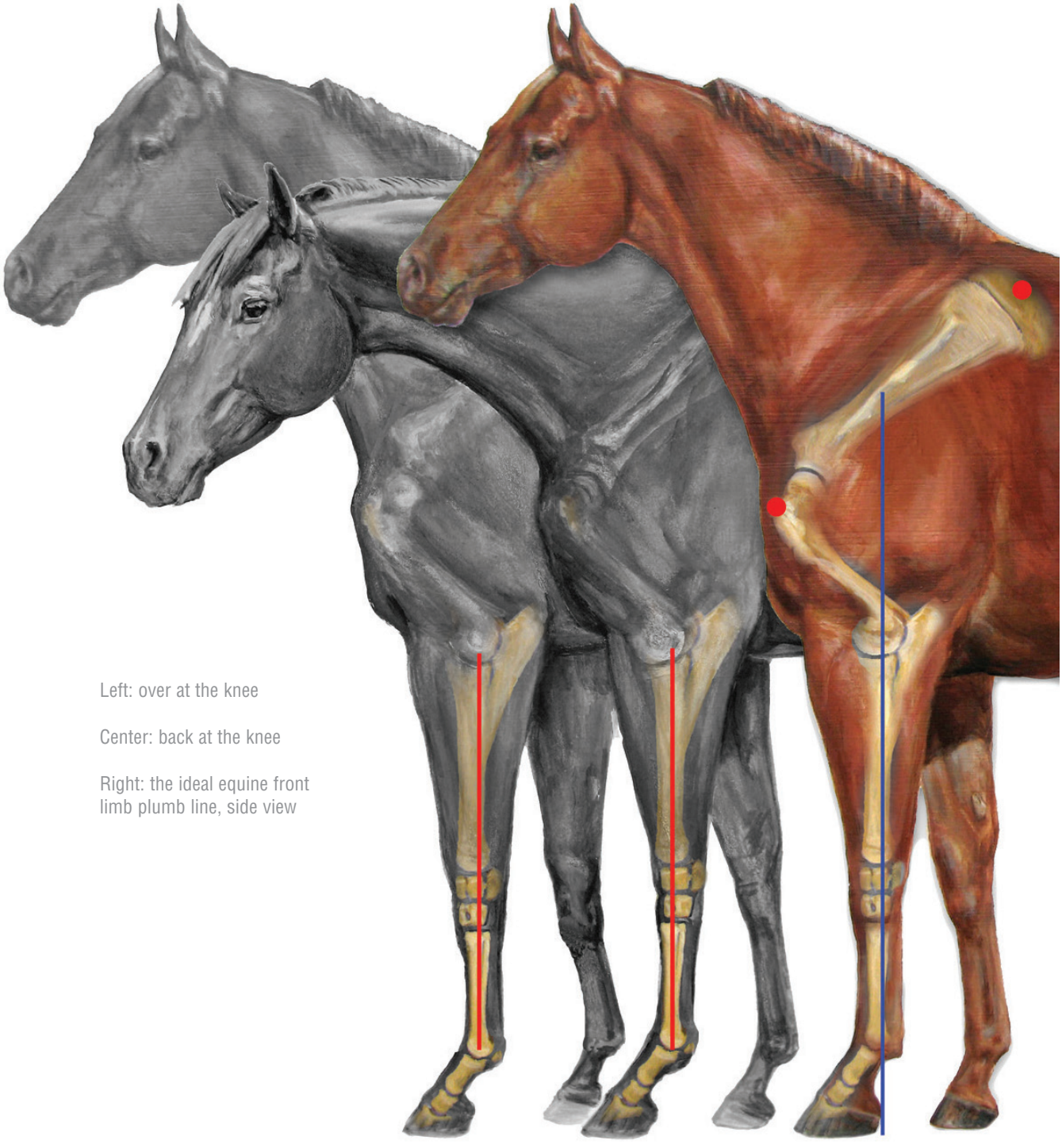
concussion evenly.

When you have that plumb line in your head, it helps you see when structure deviates from it, as in the knee.

From the Side

"If there is carpal deviation going on, looking at the side view, a horse is typically either over at the knees, commonly called 'buck-kneed,' or he'll be back at the knees, called 'calf-kneed,' " explains Dr. Jerry Black.

"Think about how the horse flexes his knee or carpus: The limb normally is stable at the knee at the time of concussion and flexes dor-



Left: over at the knee

Center: back at the knee

Right: the ideal equine front limb plumb line, side view

sally, or toward the front, during motion. As fatigue sets in with loss of muscle tone, the knee may bend caudally, or toward the back, causing additional stress to the carpal bones, ligaments and cartilage.

"If a horse is over at the knees, he's still able to flex normally. When a horse is slightly over at the knees, he is usually able to maintain stability in the leg without affecting the limb's function."

It's opposite in the horse that is back at the knees.

"In that case, the direction of the deviation is opposite of the way the knee flexes," Dr. Black continues. "So as the horse lands and receives concussion with the knee in that back position, rather than being able to absorb concussion by flexing the knee, he's going to drive the front of those carpal bones into each other, putting significant stress on the knee."

It makes Dr. Black more critical of the calf-kneed horse than the horse that is over at the knees, even a horse that's minimally calf-kneed.

"Certainly a calf-kneed horse could go on to light or moderate performance or pleasure work, but when you ask anything of him that would fatigue him – like cutting or especially racing – you're in danger of him receiving an immediate injury like a knee chip, or over time, ending up with cartilage erosion and arthritic changes in that joint.

"As soon as the calf-kneed horse starts to tire, that caudal (backward) deviation is going to be exaggerated with every stride. (Because of its structure) the knee is not able to dissipate the concussion and the forces of energy properly."

He adds: "It's certainly an undesirable trait and something to breed away from."

A Judge's View

Tim Finkenbinder says you have to do more than say "a horse is bad-legged."

"There are some faults that are more serious than others, and you need to identify them and call them that way," he continues. "From a judge's perspective, calf knees are a more serious fault than buck knees – that's fact, not opinion.

"I think being back at the knees is the No. 1 fault that gets by when people evaluate a horse because they don't see it as easily as they do the horse that is over at the knees."

Correctly evaluating the knee is important in buying, breeding and judging horses.

"The structure of the legs is 99 percent genetic," Tim says. "Anyone raising horses needs to be a responsible breeder and raise the most sound, structurally correct animal they can. In order to do that, they have to be able to evaluate conformation. You can't breed a bad-legged mare to a bad-legged stud and expect to get a good-legged colt."

He adds: "What judges let get by (in a conformation class), so will the public. And they'll keep bringing it to the show pen. The best way to promote good stewardship in breeding horses is through the judges and how they reward what is correct, and incorrect."

NEWBORNS

"Some foals are born terribly buck-kneed and are not able to maintain a normal stance because of it," says Dr. Black. "Often, it can be due to their in utero placement, or positioning inside the mare. It could be because of laxity (in their tendons) and overall lack of strength when they are born.

"It's an issue that may require significant veterinary attention, but often they just need to get a few days older and they will correct themselves.

"With those foals, you do not want them to over exercise until they can gain some strength and correct or they'll damage those immature carpal bones quite easily. Limit their turnout until they are stronger and older.

"This is even more applicable to foals born with the calf-kneed condition, due to the additional stress placed on the front of the immature carpal bones and cartilage that constitutes the joint surfaces."

Part 3: Fetlock and Pastern

The fetlock joint and pastern region is the equine front limb's primary shock-absorbing mechanism – no small function when you consider that the front limb bears 60 percent or more of the horse's weight.

"When the fetlock and pastern drop as the limb meets the ground, there is concussion that dissipates out through the hoof and lower limb. This cushions the upper body from the hard jolt of the weight-bearing phase of the stride," explains Dr. Jerry Black.

"You get stretch in the suspensory apparatus (tendons and ligaments along the back of the lower limb, including the sesamoid bones) as the fetlock and pastern drop, and then the suspensory rebounds as the limb is lifted."

How well the shock-absorbing mechanism functions is greatly dependent on the pastern's angle and length, and bone structure in the pastern and fetlock region.

As the pastern extends down from the fetlock, the angle formed between the line it follows and a line parallel to the ground should ideally be around 45 degrees.

"We're looking for the pastern to mimic the same angle as the shoulder," Dr. Black continues. "Horses with good shoulder angulation will tend to have good angulation in the pastern.

"In addition, you want the line from the pastern to continue symmetrically down the hoof to the tip of the toe, so that the hoof/pastern axis is unbroken."

Dr. Black also points out that "moderate length to the pastern aids in that drop and absorption of concussion."

It's also important to look at the size and width of the bones involved.

"Horses that have a good diameter to the cannon bone will also generally have good width to the lower cannon bone joint surface and the upper articulation to the fetlock joint," Dr. Black explains. "The fetlock joint should have a broad surface – best seen from the front – because that increases the surface area of the joint and the amount of cartilage that cushions it. This makes the joint better able to withstand stress and fatigue and to drop the fetlock at the same time."

GOOD BONE

Dr. Black points out that a moderately short cannon bone improves the strength of the suspensory apparatus, benefiting the shock-absorbing capability of the lower limb.

"When you start looking at bone in general," Dr. Black adds, "you want the diameter of bone, its thickness and size, to correspond to body mass.

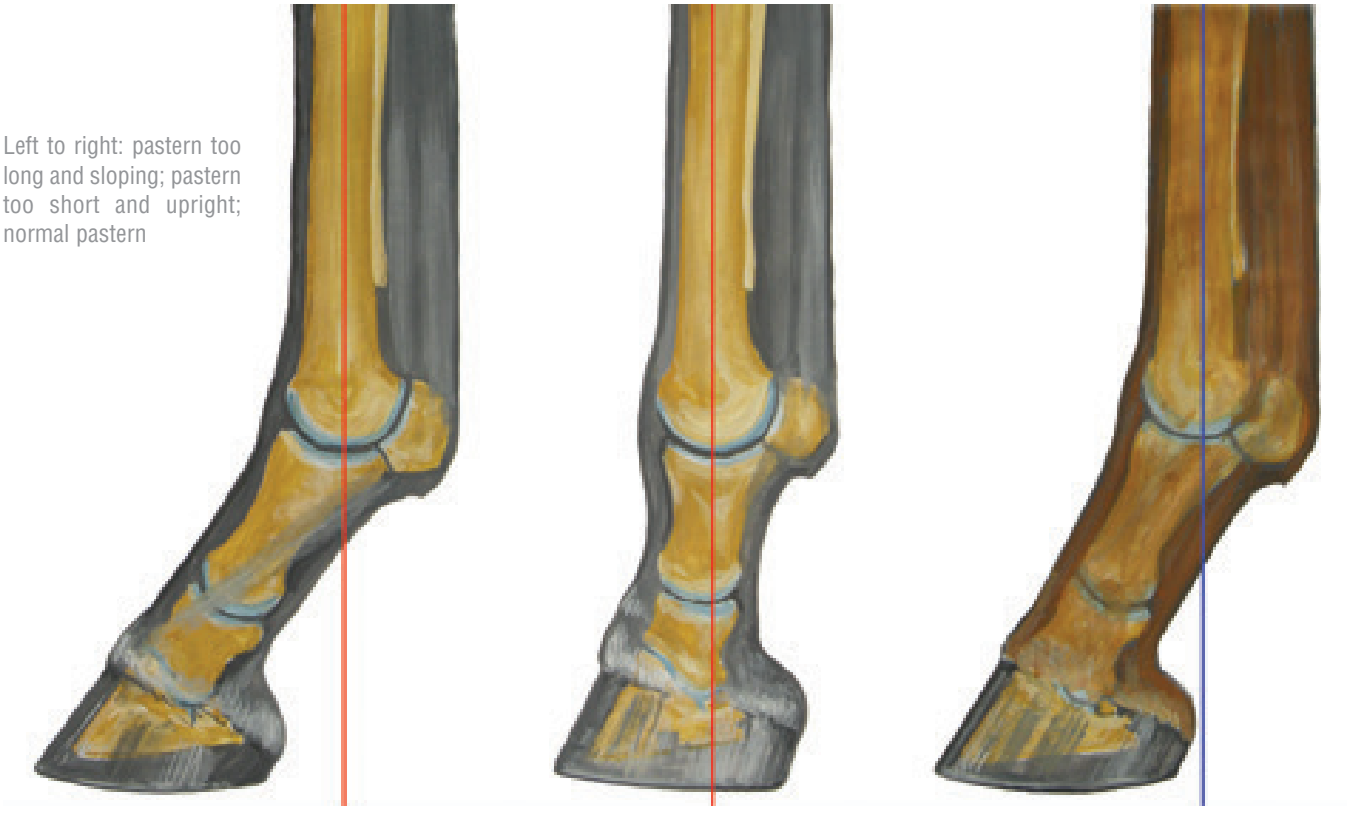
"Unfortunately, you often get larger-bodied horses that have very small bones, and the easiest place to see it is in the cannon bone. It's hard for that horse's skeletal system to support that body mass even if the bones are correct in their angulation.

"A good-boned horse is a horse that has enough depth and width of bone to support the rest of his body."

Deviations and Extremes

To evaluate the pastern and fetlock, go back to the plumb line that runs down the ideal front limb: From the side, viewing a horse standing balanced on level ground, imagine a plumb line from the middle of the scapula (midway between the crest of the scapula and the point of the

The angle of the pastern corresponds with the angle of the shoulder.



Left to right: pastern too long and sloping; pastern too short and upright; normal pastern

shoulder) that runs straight down to the ground. The line should go straight through the column of bone – the forearm (radius), knee (carpus) and cannon bone – exiting at the fetlock to hit the ground just touching the bulb of the heel.

That structure gives the front limb the strength and flexibility necessary to absorb concussion evenly.

If a horse is too upright or straight in his pasterns, that plumb line will go through the fetlock and through the pastern bone and hoof, indicating a straight column of bone with no flex to it.

"A horse with upright pasterns doesn't have the shock-absorbing mechanism to effectively dissipate concussion, and it affects the entire lower limb," Dr. Black points out.

"Excessive downward force is placed on the fetlock joint and coffin joint (in the hoof). In addition, the rear of the short pastern bone in an upright horse is immediately over the top of the navicular bone, making it subject to trauma."

Tim Finkenbinder points out: "When a horse is excessively straight in his pasterns, he'll want to knuckle forward in the fetlock. People tend to think that's a problem with a mineral deficiency or nutrition, but for the most part, it is genetic.

NEWBORNS

"Foals born with significant laxity in their tendons, and significantly dropped in their fetlocks, are not that uncommon," Dr. Black says. "Most of those foals, if they are kept in confinement, and not allowed to over-exercise, will strengthen in a few days."

Your veterinarian might apply supportive temporary heel extensions.

"Conversely, foals that are born very straight, on their tiptoes or knuckled over, need medical attention early on, especially if they are unable to stand."

Splinting can often help those foals.

"If you have a foal born in a pasture, and you're dealing with either of those conditions, you need to get that foal in where he's not overly fatiguing himself trying to keep up with his dam. They do typically thrive in stall confinement, and should remain there until the musculoskeletal system has strengthened. That could take as long as four to six weeks in severe cases. Less severe cases tend to improve in a few days."

The only way to fix it is to breed away from it.

"You can change the angle of the hoof – build it up in the heel – so the limb can better lock in to the fetlock joint. That can help the horse, but it's not changing the pastern angle.

"We can forgive the knee when it bucks forward, because it's designed to flex forward," Tim adds, "but we can't forgive the pastern at all when it bucks forward, because it's not designed to flex that way; it's meant to flex back and downward.

"That horse can't be ridden and is unsound standing."

On the other hand, a horse that is too long and sloping in the pastern also has problems. In that horse, the plumb line exits the fetlock and drops to the ground well behind the bulb of the heel, indicating a weakened shock-absorbing mechanism.

"Horses with this conformation fault have too much downward force when the fetlock drops and tend to overstretch the suspensory apparatus, especially when you add fatigue," Dr. Black says. "They are more prone to injury in that area."

A horse with excessively long and sloping pasterns is often called "coon-footed."

"Standing still, that horse is already flexed to the point where he has no shock-absorbing capability at all," Tim says. "It is hard on the sesamoids. When he hits the ground, everything is already fully extended to the point where there's too much give. That horse will be the first to break down."

Tim sums it up: "A horse that is knuckling forward in his pastern is as unsound as a truly coon-footed horse. They are both accidents waiting to happen."

Changes

Dr. Black also looks for smoothness in the fetlock and pastern, and watches out for irregularities. If you notice prominences at the back of the fetlock, thickening to the joint's front, or a thickening of the pastern area – those can all indicate trauma to bone and/or supporting joint tissue.

"When there's evidence of soft tissue and bone remodeling, technically, that is called arthritis as a result of injury and inflammation of the joint," Dr. Black says. "When you start to get bony and cartilage changes in the joint, then you are developing osteoarthritis."

Tracking

In the Quarter Horse breed, Tim says it's more common to see horses too upright in their pasterns than it is to see them too long and sloping.

"I can tell that a horse is too straight in his pasterns just by watching him track," Tim says. "He's not a good mover at all; he doesn't stride out right. He walks almost flat-footed and short-strided.

"If one is severely upright, he'll often try to put more weight on the rear end, and I've seen horses almost shuffle."

A Judge's View

"A good judge and horseman shouldn't be in the mindset of looking for problems; problems should jump out at you," Tim says. "I never look for issues, because if you look hard enough, you can find something about any horse that will bother you."

Instead, Tim says, you need to work on training your eye to see structure for what it is, keeping in mind the ideal.

"Proper leg structure is the same for all horses," he says. "When you have the opportunity, you should take the time to look at structure in horses in all disciplines, not just your own.

"If you look at something long enough, it starts to looks normal to you, and that's a problem if what you're constantly looking at is incorrect – whether that is a tendency toward pasterns being too straight or sickle hocks."

Part 4: Knee, from the Front

When you move to evaluate the front limb from the front, you continue to look for conformation that allows the limb to properly absorb concussion.

Again, start with the ideal – imagine a plumb line starting at the point of the horse's shoulder that drops straight down to the ground. As it goes down, the line should bisect the forearm, knee, cannon bone, fetlock, pastern and hoof.

"You want straightness in that column of bone," says Tim Finkenbinder. "It's just as important as straightness in the side view. It determines how weight distribution and concussive force is handled by the leg."

Deviation in that straightness puts undue pressure on the joints and ligaments, such as in the knee.

In and Out

"There are three common deviations in the knee we consider potentially to be a problem," says Dr. Jerry Black. "All of them compromise the horse's ability to receive concussion equally on the inside, the outside of the knee and the entire front limb, as he bears weight and receives concussion."

When a horse is "in at the knee" or "knock-kneed," the knee angles to the inside of that imaginary plumb line.

"In that deviation, called carpal valgus, the knee sets far to the inside of where it should normally set and the cannon bone is displaced laterally, to the outside of the knee," Dr. Black explains. "There is significantly more stress placed on the inside of the knee.

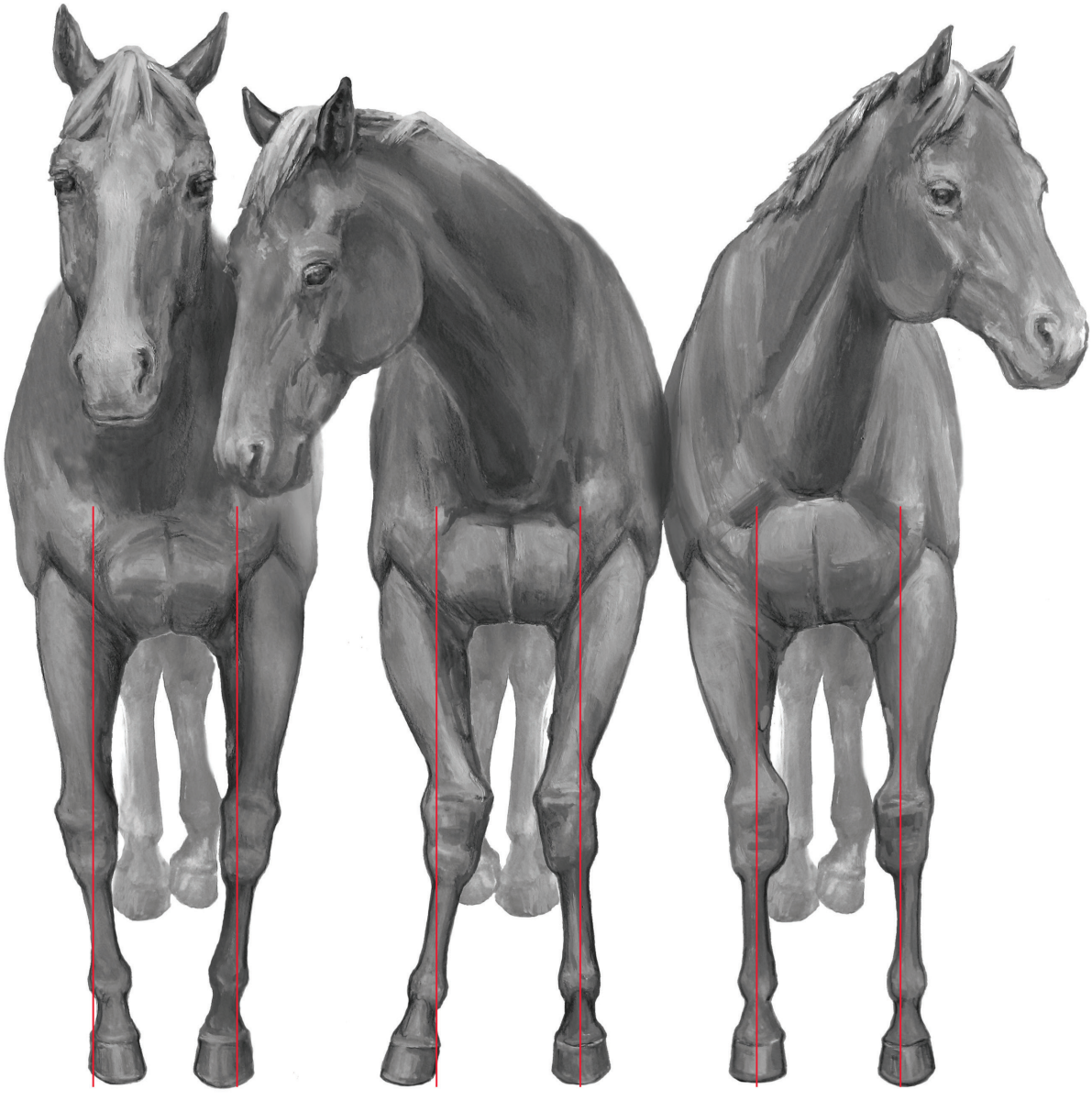
"Those horses are much more prone to secondary arthritic changes and may tend to have bone chips. They do not stand up well to a significant amount of performance stress."

Dr. Black adds that it's common to see the condition in newborn foals, but most grow out of it.

"Foals born significantly knock-kneed should certainly have limited exercise, because their bones are just not mature enough to take that stress in the knee," he says. "They should be kept on stall confinement until they get more strength; they typically will correct themselves within 60 days."

Tim adds: "For whatever reason, we just don't see that many horses that are in at the knee anymore."

When a horse is "out at the knee" or "bow-legged," the knee angles to the



Left: out at the knee; Center: in at the knee; Right: bench kneed

outside of that imaginary plumb line.

"In the case of carpal varus (out at the knee), again, concussion is not properly received down the leg," Dr. Black explains. "There is significantly more stress placed on the outside of the knee.

"Although it's a deviation that we don't want to see, in my experience, the bow-legged horse has not been a horse with as many secondary problems as the knock-kneed horse."

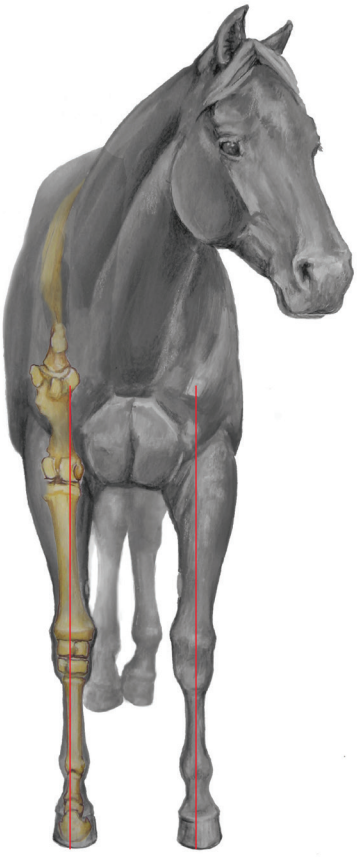
Bench

The third common front-view deviation involving the knee is the "offset knee" or "bench knees."

"In this case, the cannon bone is offset to the outside, or laterally to the knee itself," Dr. Black says. "When you look at the horse from the front, the cannon bones can be straight, but they will appear to be set too far to the outside of the knee.

"This causes two problems," he continues. "No. 1, because the inside of the knee is the more weight-bearing surface of the knee, when the cannon bone is set to the outside, that puts even more stress on the inside of the knee.

"No. 2, the second metacarpal bone, or splint bone, on the inside of



the cannon bone now receives too much force of concussion because it's positioned into the main weight-bearing area. That horse is more prone to problems with the splint bone, and that shows up as a tearing of the ligament and a typical splint.

"Splints occur pretty young in the bench-kneed horse; I've certainly seen them show up before the horse is in any kind of training."

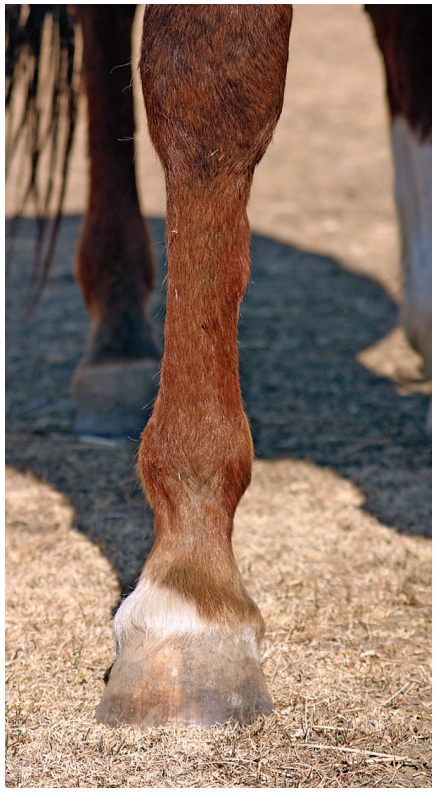
Tim adds that it's important to understand what can cause a splint when you are evaluating conformation.

"From a judging standpoint, a splint is a red flag, but it's not something that is an automatic detriment to the horse," Tim explains. "A splint tells you to look a little closer at the front leg structure."

The splint could be caused by an injury in the pasture or in performance, and is a blemish on the leg; or it could be caused by structural problems like bench knees, which points to unsoundness.

"If a horse is standing there with a pair of big splints, one on each front leg, there's a reason why and chances are he's got structural problems.

"If a horse has one splint and I don't see any structural problem that caused that splint, then I'll call it a working man's callous, and I'm not going to hold it against the horse."



The chestnut horse's splint (above) is what Tim calls a "working man's callous": a splint with no apparent bone structure problem behind it. The palomino's two splints (below) are red flags that point to his bench knees

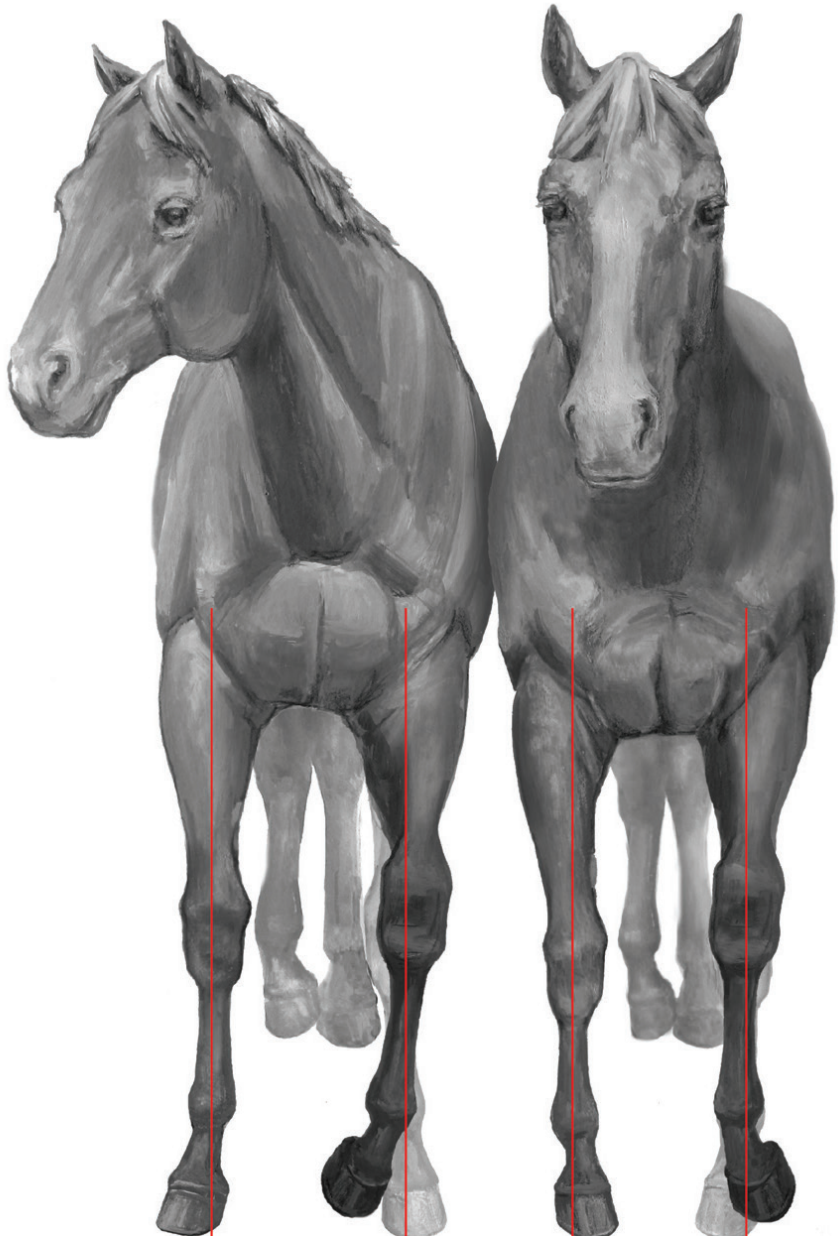
Part 5: Lower Front Limb and Movement

A horse can be dealing with a combination of deviations in his front limbs, and they will greatly affect his legs' ability to absorb concussion and his overall movement.

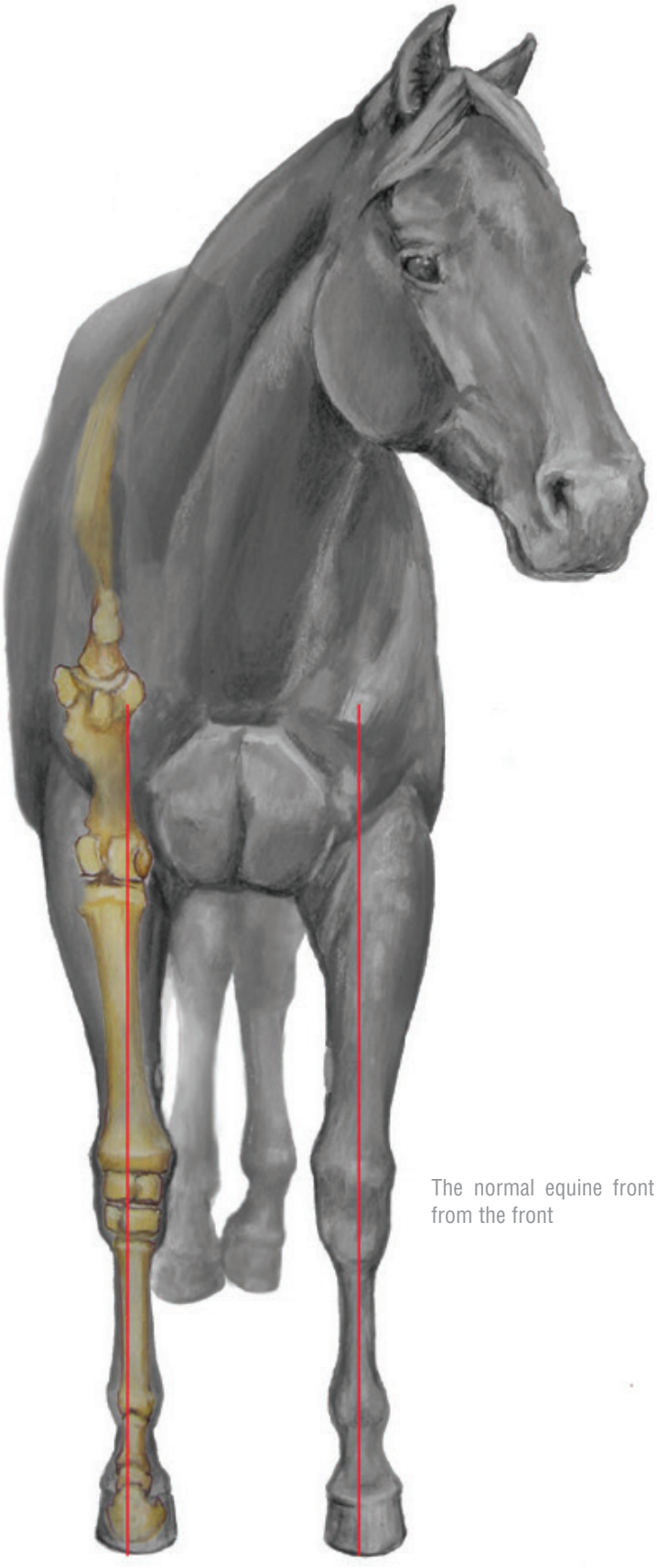
"When I'm facing the horse's front, I visualize that ideal plumb line," Tim says. "It helps you form a description of what you're seeing in the horse's structure."

Starting at the point of the horse's shoulder, the ideal plumb line drops straight down to the ground, bisecting the forearm, knee, cannon bone, fetlock, pastern and hoof along the way.

In Part 4, we looked at common knee deviations as seen from the front; in Part 5, we move to the lower limb.



The toed-out horse, left, wings as he tracks; the toed-in horse, right, paddles.



The normal equine front limb, from the front

Fetlock and Pastern

"When we're looking at the fetlock from the front, we want the joint to be wide and smooth with no irregularities," says Dr. Jerry Black. "Irregularities – bumps, swellings or puffiness – indicate trauma with possible joint surface remodeling and/or in the soft tissue that supports the joint.

"These early changes, also called 'osselets,' are pretty readily seen from the front. The horses just look like they have bigger ankles and they don't look as clean."

The pastern should be smooth as well, and Dr. Black watches out for irregularities there, too.

"Some horses will get a thickness of the joint capsule and remodeling in the pastern," he adds. "When you look at them, it's obvious that they are thickened above the coronet. That's a significant sign of potential arthritic change."

There are two main structural deviations that are common culprits behind arthritic change: a horse that toes in, or is "pigeon-footed," and the horse that toes out, or is "splay-footed." When a horse is toed-in, too much of the hoof falls to the inside of the ideal plumb line; and on the toed-out horse, too much of the hoof falls to the outside of the plumb line.

"When you have these deviations, especially if they are significant, the

long-term concern is that they don't receive concussion equally across the fetlock and pastern," Dr. Black explains. "They take more pressure on one side or another of the joints, making them more prone to arthritic changes over time."

Dr. Black adds that these deviations occur in all shapes and forms, but a high number occur bilaterally: A horse will be toed-out or toed-in in both front legs.

"You certainly have horses that will deviate more on one side vs. the other," he adds. "I have often seen horses significantly splayed out in just one lower limb."

Movement

"When I'm evaluating a horse, I'm very critical of horses that tend to deviate enough in their distal (lower) limb that it causes gait alteration," Dr. Black says. "I have to be critical, because gait-altering deviations will put extra pressure on the distal joints over time.

"It's not that they can't be useful for some purpose, but they won't stand up to heavy work."

A horse that toes out has an inward motion to the foot as he picks it up; that gait alteration is called "winging."

"The foot takes off more on the inside of the toe and the leg slings the foot to the inside," Dr. Black explains. "That horse often will interfere with himself – knock or brush the other foot – as he steps forward.

"When I evaluate a horse, I check for abrasions and scars in the fetlock and pastern area that would indicate he is interfering due to poor conformation."

The toed-in horse has an outward motion to the foot as he picks it up, referred to as "paddling."

"It's no less stress on the joints," Dr. Black says, "but at least he won't hit himself as he moves forward."

From the Judge: Tracking

"Tracking goes hand-in-hand with conformation – the tracking is the function, and conformation is the form that's creating it," Tim Finkenbinder says. "If a horse doesn't travel properly, there is a conformational reason that it's not."

The conformation class requires a judge to view a horse tracking toward and away from him/her. Several problems can affect the way a horse travels: Winging in the toed-out horse and paddling in the toed-in horse are two that are readily identifiable.

"As a judge, I want to see a nice, straight, flat-footed walk where the bone column is straight," Tim describes. "I want to see ample bone and foot, too. I want to see the horse come at me true and strong, with no (lateral) flex or bend either way when he hits the ground. When he jogs out, he has cadence and isn't short-strided."

Poor tracking red-flags a horse for a closer individual inspection from the judge. Tim thinks exhibitors should practice tracking just as much as they practice setting up – a handler can make a sound and correct horse look unsound and incorrect in the way he/she tracks the horse.

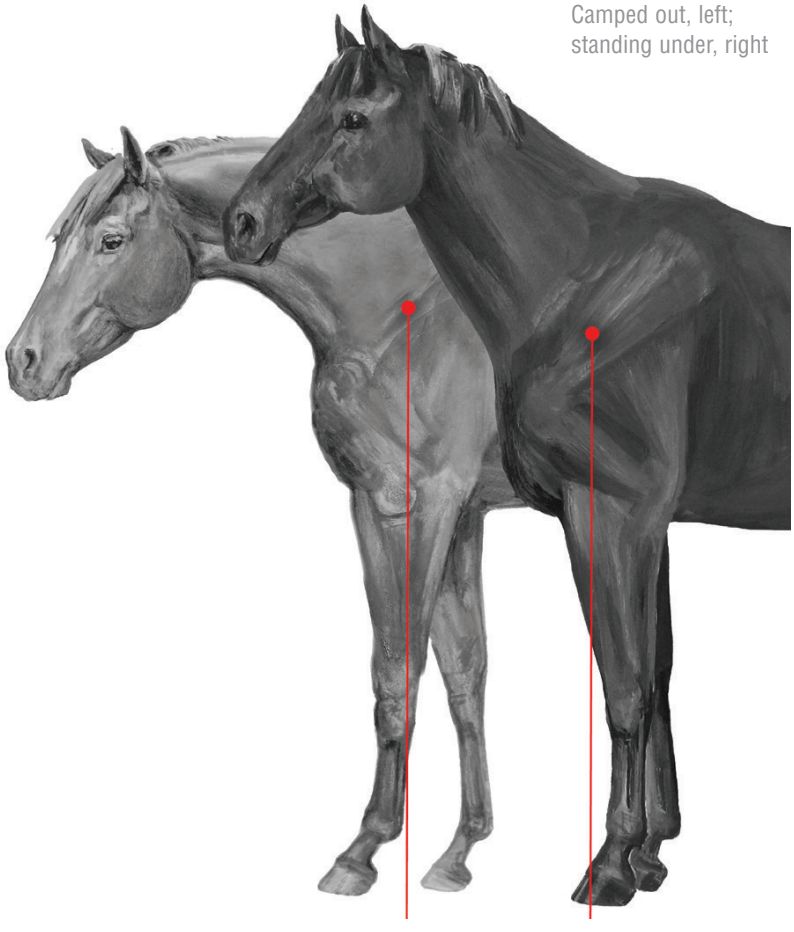
"A horse that's high-spirited often doesn't come at the judge straight and will trot away sideways," Tim adds. "I think judges ask a horse to re-track more often because they didn't get a good look at the horse than they do to check for unsoundness.

"The way a horse travels tells the tale. When a horse is standing still, people can cover up conformation problems with shoeing, but it's almost impossible to cover up the way a horse tracks."

Tim emphasized again: "Structure in the horse is 99 percent genetic. We need to raise the most structurally correct, naturally sound animal we can."

Part 6: Front Limb Deviation from the Shoulder

Most of what we've covered so far has been from the knee down, but front limb deviations can also originate above the knee, in how the limb connects with the shoulder. When a horse has structural problems in the shoulder and forearm region, it can adversely affect the limb further down – here are four, as seen from the side and from the front.



Camped out, left; standing under, right

From the Side

Looking at the horse from the side, when you drop the imaginary plumb line down from the midpoint of the scapula, if a horse stands so that the front limb rests in front of that line, he's said to be "camped out." If the horse stands so that the front limb is behind that plumb line, he's said to be "camped under" or "standing under."

Normal equine front limb, from the side

"When you take the plumb line down, you'll start to see the deviation from the mid-forearm down," explains Dr. Black.

"As a general rule, horses that camp out seem to be those with slighter builds and finer bones; whereas bigger, heavy-shouldered horses often have a tendency to be camped under."

Both deviations incorrectly load tendons, ligaments and bones, which can predispose a horse to injury of the suspensory apparatus or joints.

"There is nothing that says that either of these horses can't be athletic," Dr. Black adds. "And there are other anatomical deviations that are more significant to sound- ness than these two."

From the Front

Similarly, when you move to the front view and drop an imaginary plumb line down from the point of the shoulder, the front limb can stand to the outside of that line, referred to as "base wide."

"Again, horses that tend to be slighter built, the more narrow-shouldered horses, tend to be base wide," Dr. Black says. The chest is narrow and the front legs angle outward as they come down.

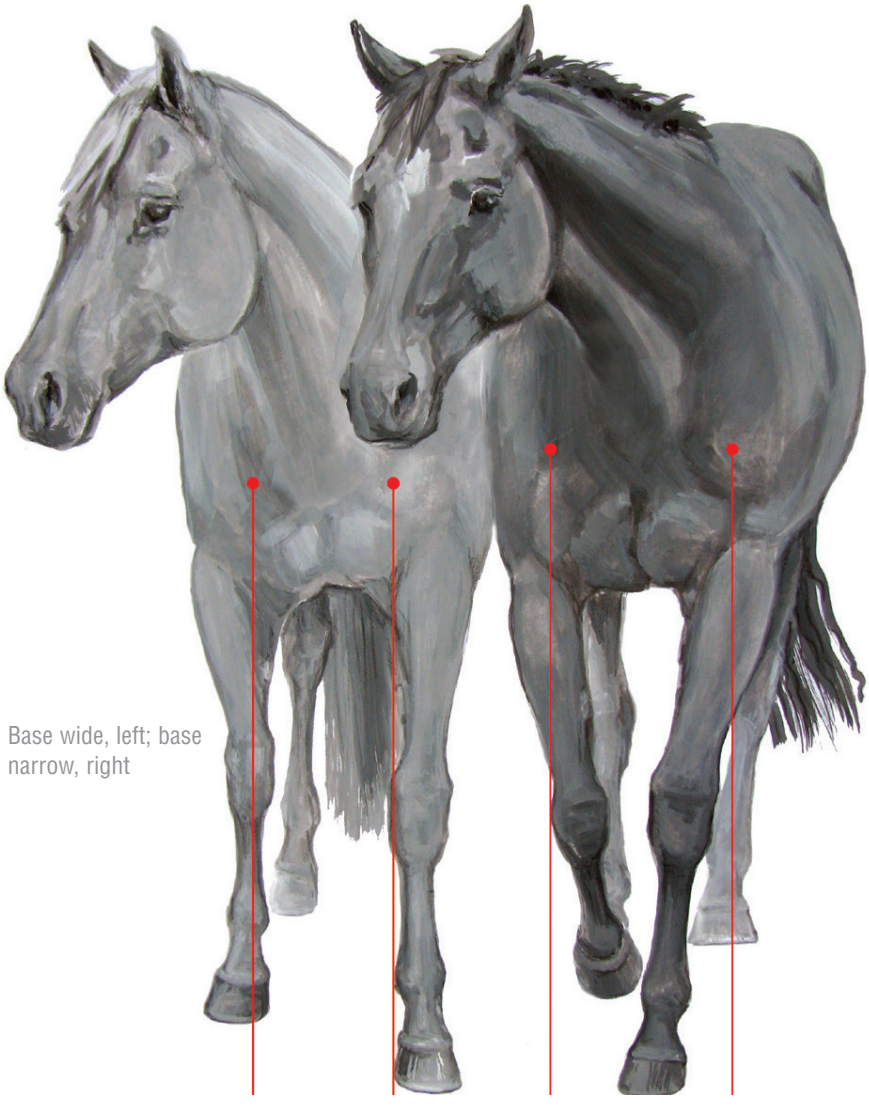
Going back to the imaginary plumb line dropping down from the point of the shoulder to the ground, the front limb can also stand to the

inside of that line, which is called "base narrow."

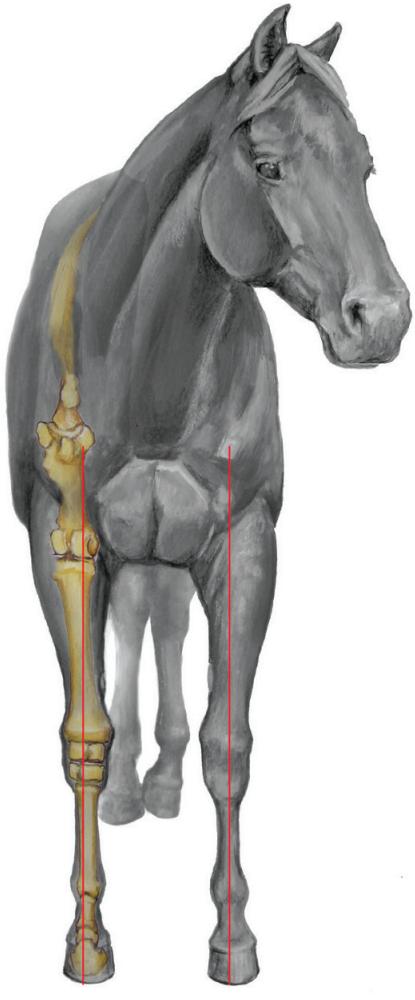
"The base-narrow horse can tend to be the broader-chested, heavier-built horse, where the space between the forearms is wider than the space between the front feet," describes Dr. Black.

However, Dr. Black points out that a heavily muscled halter-type horse might have a base-wide stance as well.

Tim Finkenbinder describes it: "It's not uncommon to see halter horses with forearms set out from the points of their shoulders. It doesn't have to do with how much muscle they've got as much as that they are too wide at the point of the shoulders and it goes all the way down the legs – they are far apart.



Base wide, left; base narrow, right



Normal equine front limb, from the front

"It just affects the physical ability of that horse to handle himself athletically up front," Tim continues. "They're cumbersome; they physically don't have flexibility in the front end.

"If a horse is bench-kneed, in my experience, he usually will be a little base wide and flat-chested, too."

In either case – base wide or base narrow – the limb is incorrectly loaded, putting additional stress on the joints of the lower limb.

"Sometimes it's not too obvious what deviation is in play until you watch a horse move," Dr. Black points out. "The ideal gait to really evaluate whether or not a horse is base wide or base narrow is the walk."

Tim adds: "Neither horse is going to be a pretty mover."

Part 7: Hind Limb, Starting with the Croup

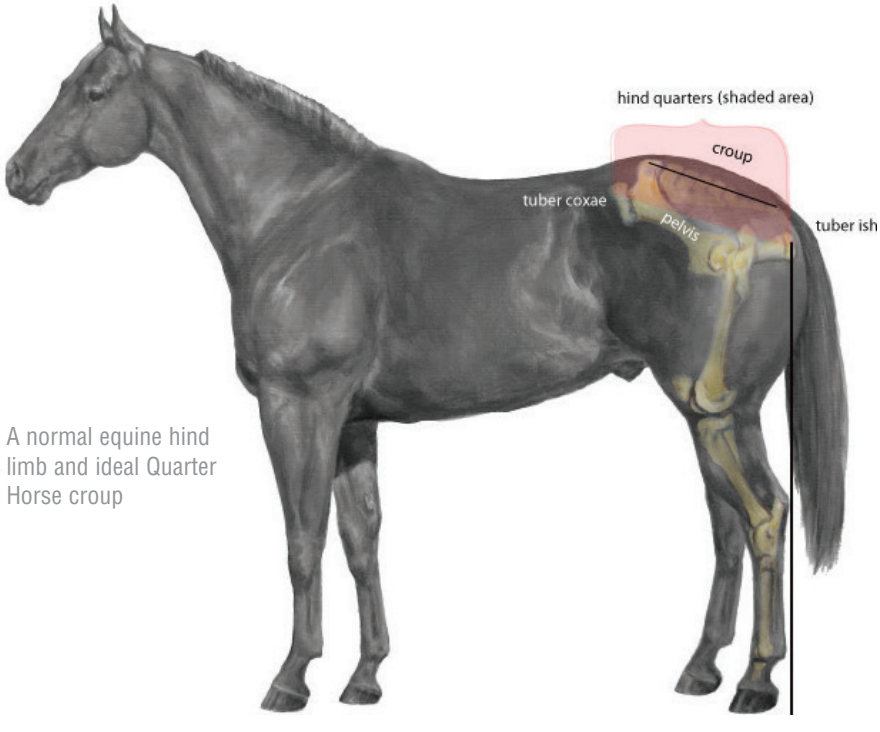
A horse's overall balance comes first in any conformation evaluation, but the structural framework underneath that balance – in bone, muscle and tendon – is equally important, and it's hard to separate them. The goal of this book is to add to your toolbox of resources in training yourself to evaluate a horse's structure and how that affects his ability to perform.

Through the previous chapters we have gone through the basic structure of the equine front limb and common deviations; now, we move to the hind limb.

Big Picture

In terms of balance, Tim Finkenbinder looks at a horse's body in thirds – front (shoulder), middle (barrel) and rear (hindquarters).

"I want three equal, balanced thirds," Tim says. "When I look at the rear of a horse, I want to see that it matches the front end of the horse. You don't want a horse that is excessively heavy or light in his hind end as compared to the front."



A normal equine hind limb and ideal Quarter Horse croup

The croup follows the line of the spines of the sacral vertebrae

Dr. Jerry Black, adds that "we want to see an uphill or level conformation" where the withers are either slightly higher than or level with the point of the croup.

"That conformation helps a horse to be able to drive up underneath himself and push himself forward," he explains. "We have to keep in mind with the hind limb that its primary function is to propel the horse forward. The skeletal structure and the musculature affects how the limb can do that effectively."

"The croup, the hip, the placement of the hock as you go down the hind limb is the drive train of the horse," Tim describes. "That's where the power is for forward motion. If the structure is not in line, or you don't have a lot of strength there, then there are problems with the ability of the limb to function properly."

That's why, he adds, "If a horse has to be either front- heavy or rear-heavy, I'd rather him be rear-heavy. A horse heavier in the front is cumbersome and not athletic.

"In the hind limb, just as in the front, we want to look for conformation that will promote soundness and durability," Dr. Black emphasizes. "We want conformation that won't hinder a horse in his career and that won't cause pathological problems from early on in its career."

Croup and Hip

Seen from the side, the topline of

the croup follows the spines of the sacral vertebrae from the lumbosacral joint to the tailhead.

When you hear someone call a horse "long in the hip," that's a reference to the line running along the pelvis from the tuber coxae to the tuber ischii. This is part of the croup area as well.

The "hindquarters" refers to the muscles running along the pelvis from the point of the hip (tuber coxae) to the point of the buttocks (tuber ischii), and from the tail head down the buttocks. (Those include the gluteal muscles, biceps and semitendinosus, etc.)

"The heavy muscles of the hip and thigh (femur) are what literally drive the limb forward," says Dr. Black. "As a breed, it's obvious that Quarter Horses are designed for work and power and speed because of the musculature in their hind ends."

As with the shoulder, it's important to evaluate the angle, muscling and length in the croup and hip.

"The croup angle (the angle it makes with a line parallel to the ground) may vary according to the breed or discipline type within the Quarter Horse breed," Dr. Black explains.

"Horses that tend to be working stock horses generally have moderately more angle to the croup. This angulation allows them to step the hind limb further forward and get up underneath themselves. That makes for good stopping and turning ability or for a quicker start from a standstill. However, this angle cannot be excessive, such as a horse with a steep croup.

"Horses with less angle to the croup, or a more 'flat croup,' tend to have a longer length of stride: The limb comes forward and extends back – like a Thoroughbred racehorse."

Again like the shoulder, the angle of the croup and hip impacts the angles of the hind limb further down, and problems in the lower limb often originate higher up.

"Those angles affect a good part of the distribution of concussion in the hind leg, and how well the horse can really load as he moves his legs up underneath him," Dr. Black says. "Then, when he contracts those heavy muscles in the hindquarters, those angles open and push him forward.

"As a general rule, horses that tend to be straight and upright in the shoulder – that will carry through to the hindquarters, but not always; I have seen horses with a decent angle to the shoulder but that are relatively straight behind."

Dr. Black adds: "In any case, you need good musculature in the croup and hindquarters to aid in pulling that limb up underneath and then in pushing off."

Tim points out that the length of the hip and croup affects musculature.

"If a horse is short in his croup, he's going to be short in the hip, too," Tim says. "To have a strong, muscular hip and adequate length of flank, a horse needs adequate length in his croup."

Too Steep and Too Short

"We want a nice, long, sloping croup," Tim describes.

"You want to avoid excess – too flat, too steep or too short. I can't think of when I've penalized a horse for having a croup too long.

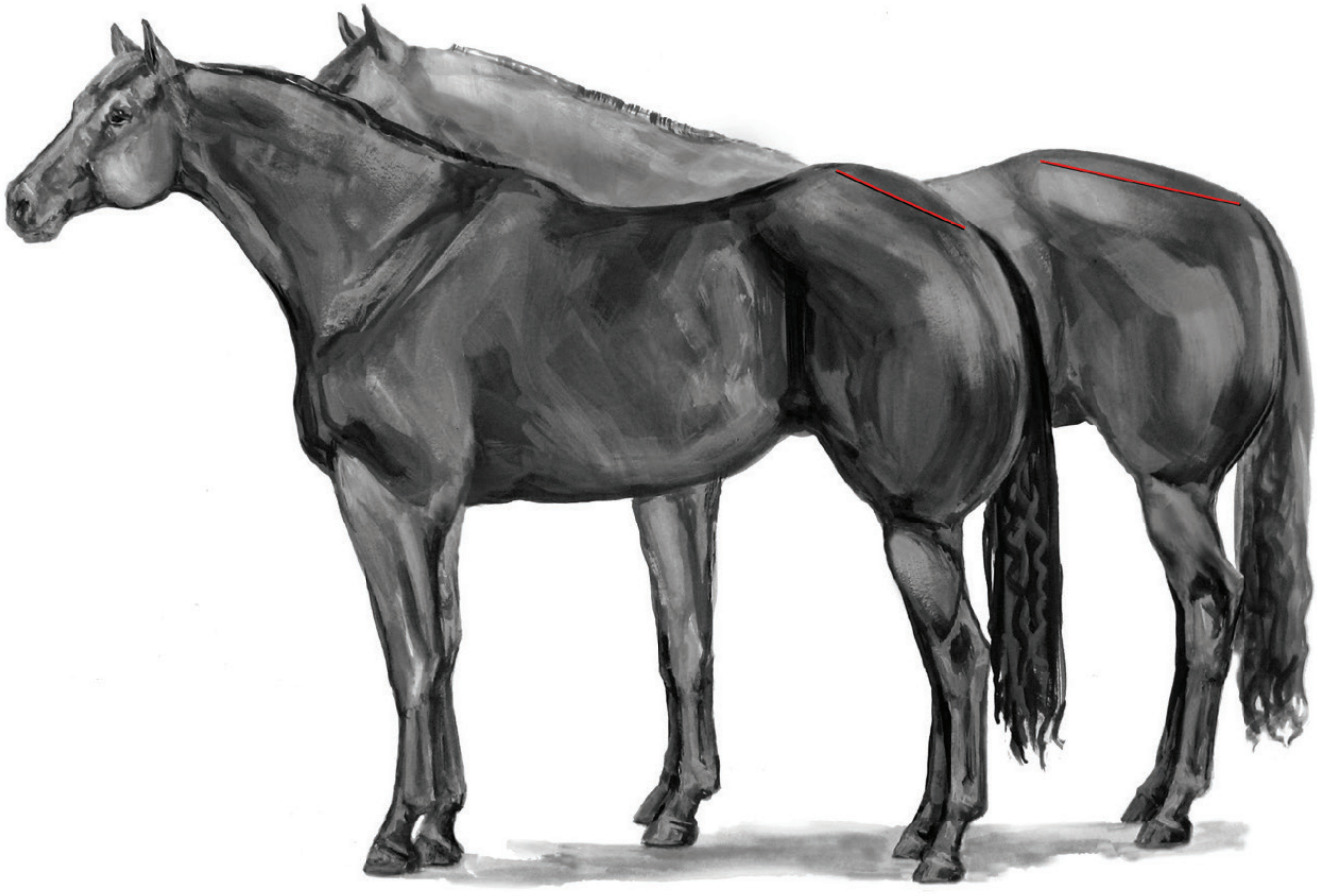
BORN WITH IT

Tim reiterates the importance of recognizing structural faults in a horse that won't change, versus those that could.

"As far as the length and angle of the croup – just like the shoulder – what a horse is born with is what it lives with," Tim points out. "Don't look at a foal that is obviously short-crouped and think it will lengthen with age, because it won't. It might develop more depth but it's always going to be short-crouped."

In contrast, a croup-high yearling – where his croup sits higher than his withers – could be going through a growth spurt, and he might level out as he matures.

Left: an excessively short and steep croup
Right: a long and more flat croup



"In the Quarter Horse business, we see all kinds of faults in the croup, but the two biggest faults we see are horses that are either too short-crouped or too steep-crouped (or both). And of those two, the worst is the too-steep croup."

Both the excessively short and the excessively steep croup inhibit the range of motion and leveraging power that a horse has in his hind limb.

"It's like using a long-handled wrench versus a short- handled wrench," Tim says. "You are going to have more leverage in length to transmit the power, and in the angle you use it at."

When the croup angle is dramatically steep, that's called a "goose-rump," and the steep angle continues on down the leg: "If a horse tends to be excessively straight in his hind-quarters from hip to stifle, he'll tend to be straight in his hock and pasterns, too," Dr. Black says.

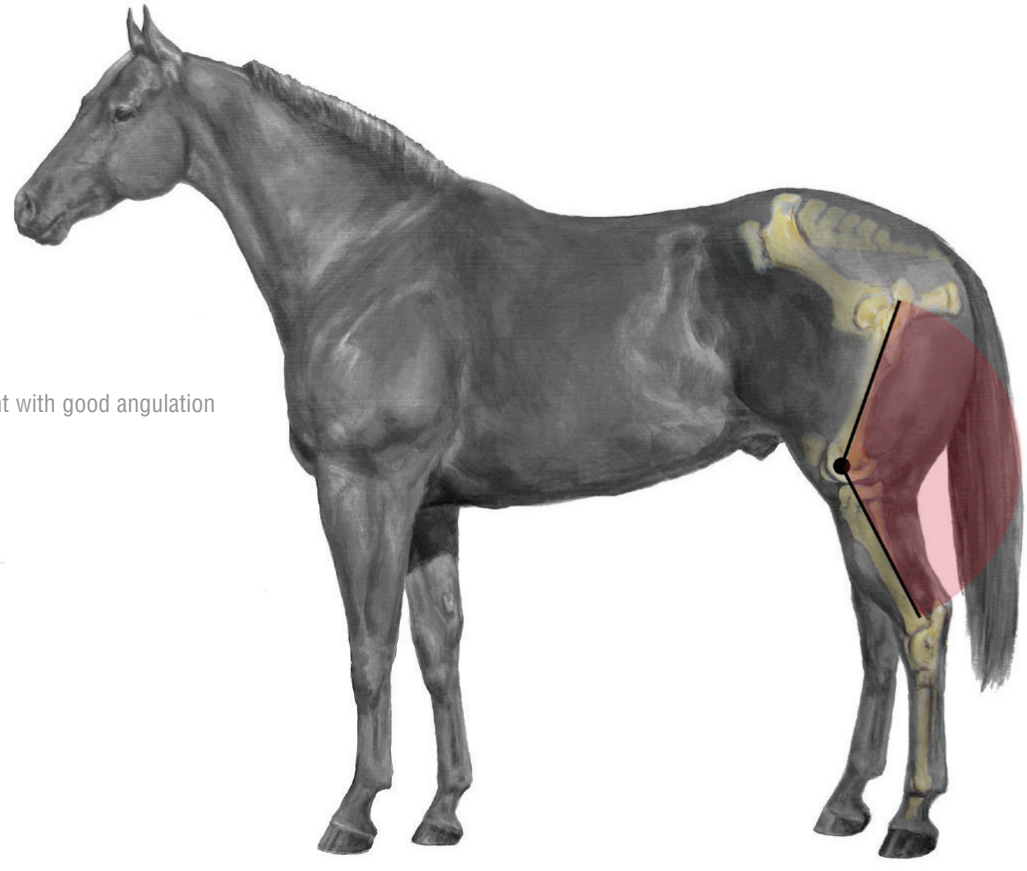
He adds: "Horses with an excessively steep croup often have an excessively short croup, as well. They have a very short, steep upper hindquarter region that carries down into the thigh, and they have no real length to the femur and the tibia. Those horses are not athletic at all, because they are unable to bend and load that limb properly."

Part 8: Hind Limb, Looking at the Stifle

The horse's hind limb supports just 30 to 40 percent of his body weight; unlike the front limb, its main function is not weight-bearing.

"We have to keep in mind with the hind limb that its primary function is to propel the horse forward," says Dr. Jerry Black.

The ability of the limb to propel the horse has everything to do with the quality of its muscling and bone and how the angles of those bones join



A stifle joint with good angulation

A horse with well-muscled stifles showing a "pear" shape: narrower across higher up at the hips than he is through the stifles.

together – and the largest bones and muscles responsible for the power of the hind limb come together in the stifle.

The conformation trends that begin in a horse's croup (see Part 7) continue in the stifle, the largest joint in the equine anatomy.

Stifle

"The stifle joint is made up of three bones: the femur (thigh), tibia and patella (kneecap). It corresponds to the human knee," Dr. Black explains. "It's very flexible and produces a tremendous amount of stress and concussion during the process of extension and moving the horse forward. The ligaments in the stifle are dense ligaments because of the pressure placed on them."

He adds that "ligamentous injury in the stifle" is one of the most common injuries in the western performance horse, which is also true of knee injuries in the human athlete.

"Fortunately, veterinarians now have the capability to evaluate stifle injuries in a much better fashion than in the past," Dr. Black says. "We can pinpoint specific ligament injuries using a variety of imaging options."

He adds that developmental bone lesions in the stifle are another problem common to all breeds, such as subchondral lesions some of which lead to osteochondritis dissecans.

To evaluate the stifle, Dr. Black looks at three things.

"First, it's critically important that the entire stifle region has well-developed muscles," he says. "That would include the musculature in the area of the thigh, the triangular area made between the stifle itself up to the point of the hip (tuber coxae) and back to the pin bones (tuber ischii)."

Tim Finkenbinder adds that muscling in the stifle region is best seen standing behind the horse. From the rear, the stifles should be the widest part of the hindquarters.

"You want to see the power down low," Tim explains. "You don't want a horse that is wider across up at the hip than he is lower, at the stifles. You want a good, rounded hip com-

ing down into bulging stifles, a pear shape."

Second is angulation.

"Good angulation between the femur and the tibia allows a horse to be more flexible and better able to pull his legs up underneath himself," Dr. Black explains. "In a working stock horse, a good angle in the stifle enables him to stop and turn athletically.

"If that angle is open too much – excessively straight – it hampers the horse's ability to do that," he says. In addition, too little angle in the stifle can lead to a tendency to experience conditions such as upward fixation of the patella.

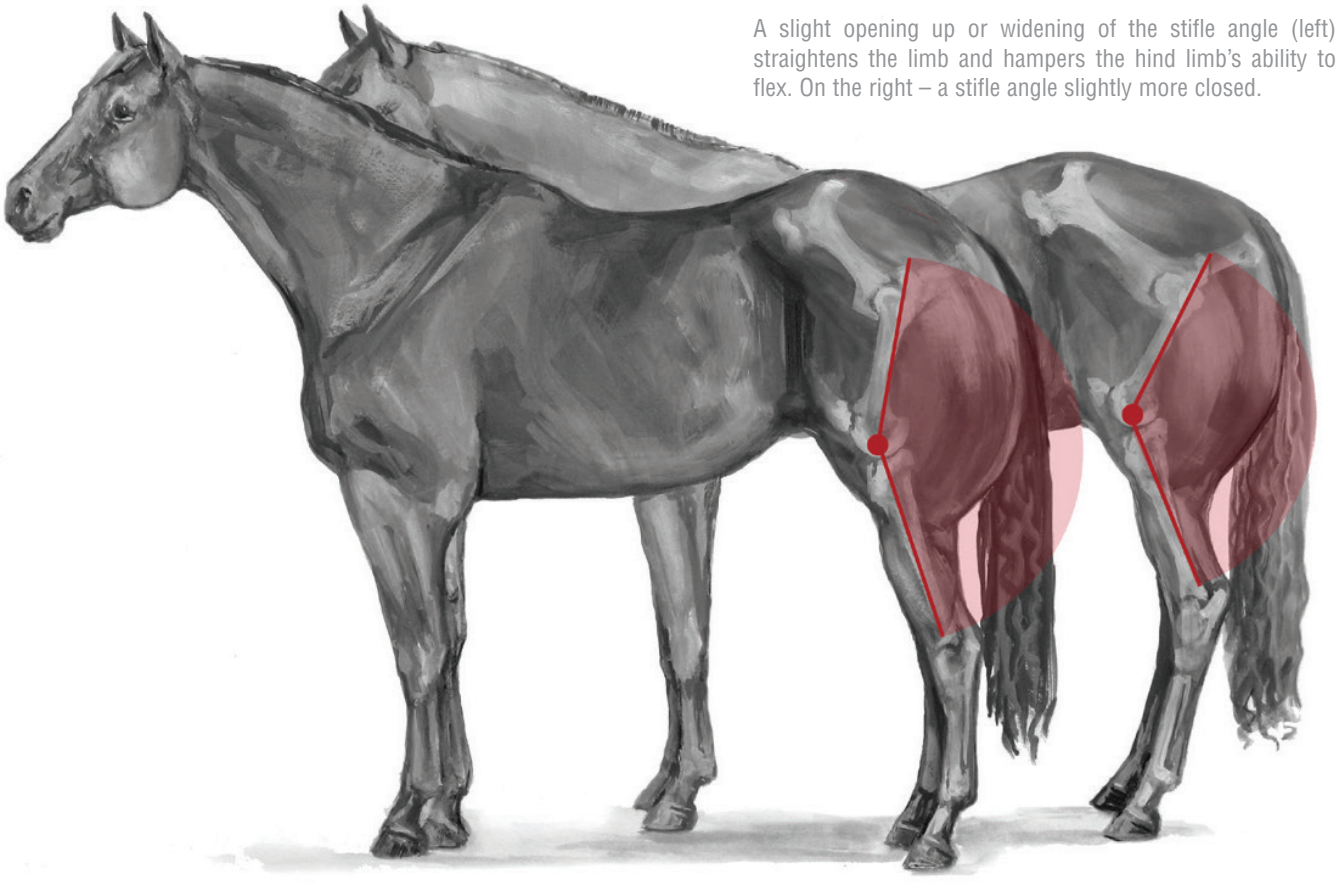
"The angle from the point of the hip to the stifle correspondingly carries on down from the stifle to the hock," he adds. The limb as a whole will trend toward slightly wider, straighter angles, or slightly more closed angles.

Finally, Dr. Black wants "all of those bony structures to be strong with good bone." The lower end of the femur and the upper end of the tibia should be broad so the stifle joint has increased surface area for strength.

He adds that a too-narrow and weak stifle in terms of bone and musculature is not commonly found in Quarter Horses, as a breed.

"The stifle and hock work in unison," Dr. Black says. "They are part of the 'reciprocal apparatus,' they flex and extend at the same time."

Musculature and bone remain important throughout the hind limb, and the angulation trends that start in the stifle continue on down the hind leg.



A slight opening up or widening of the stifle angle (left) straightens the limb and hampers the hind limb's ability to flex. On the right – a stifle angle slightly more closed.

Part 9: Hock from the Side

As the hind limb works to propel the horse forward, the leveraging power of the muscles, the bones and their angles from the stifle to the hock are crucially important.

"Remember, the stifle and hock make up a 'reciprocal apparatus,' meaning they work in unison," says Dr. Jerry Black. "They flex and extend at the same time."

The good musculature you want to see in the stifle should continue into the gaskin region, along the inside and outside of the leg.

"As we move to view the hock from the side, it is important to have a wide, full hock, skeletally," Dr. Black describes, "to make sure there is enough surface area in the joint to handle the body mass.

"The most common problem I see is hocks that proportionally do not correspond to the body mass of the horse. It's typically a heavy-muscled horse that has a slighter skeletal system where the bony mass does not correspond to muscle development.

"In addition, the 'set' of the hock, or how the hock (is angled) in relationship to the rest of the hind limb, is critically important."

Just as with the front limb, visualizing a plumb line can help an evaluation of the hock. For the ideal equine hind limb, standing square, imagine a plumb line dropping from the tuber ischii (the point of the buttocks) down to the ground. The line should touch the back of the hock and run down the back of the cannon bone and fetlock; the pastern and hoof should rest ahead of that line.

Remember, plumb lines are meant as guidelines to train your eye to see the skeleton and the angles of the bones as they fit together under the muscling. Few horses meet the ideal – the goal is to be able to better see individual deviations or tendencies and assess how they affect a horse's ability to function in his work.

A normal equine hind limb

Set

Horses tending to have slightly more angle in the hock are said to have more "set to the hock" or to be "sickle- hocked." In those horses, the plumb line touches the point of the hock, but the cannon bone angles forward in front of that line.

"It's not uncommon to see western performance horses with slightly more set to the hock," Dr. Black says. "That conformation can enable a horse to gather his hind end under himself and stop and turn better.

"A true sickle hock puts extreme pressure on the lower hock joints.

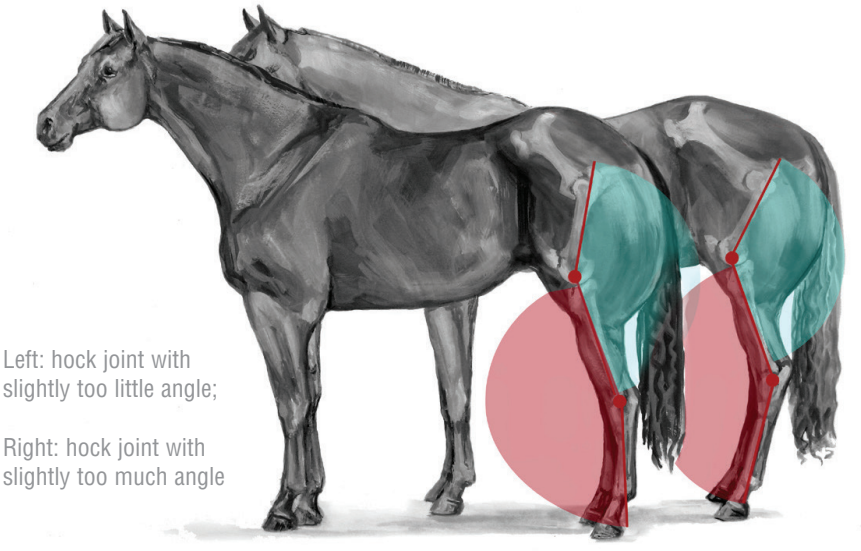
"There are basically four joints that form the hock. One is between the tibia and the upper portion of the hock, and there is a significant amount of movement in that joint. But the lower three joints involving the tarsal and metatarsal bones have very little movement in them at all.

"In an excessively sickle-hocked horse, the hock angulation puts significant pressure on the smaller hock bones in the front of the hock; those bones are basically being pounded together more due to concussion and the excessive angle of the hock.

"It tends to cause inflammation of those lower hock joints in the early stages of the horse's career. Over time, there is erosion or destruction of joint cartilage and development of secondary osteoarthritis. In horseman's terms, that is called a bone spavin."

The sickle hock conformation also puts added strain on the ligaments running along the back of the hock, which can cause problems such as a sprain to the plantar ligament, or a "curb."

"A slight angle to the hock is OK, but anything excessive creates a tendency to have soundness problems."



Left: hock joint with slightly too little angle;

Right: hock joint with slightly too much angle

Straight

Horses tending to have slightly too

LEG RATIOS

"Looking at the big picture, the knee-to-hock relationship affects a horse's overall balance," Tim points out. "If a horse's hocks are excessively higher than the knee (aka "high- hocked"), that horse will never be a balanced individual. We want those hocks lower to the ground, where a horse can maneuver and get up underneath himself."

Dr. Black agrees: "We've learned from the Thoroughbred racehorse that the more durable horse is the horse that has moderately short cannon bones. The high-hocked horse has long cannon bones, and that's not where you want length.

"Where you want the length in the hind limb is from hip to stifle and stifle to hock; then you have the corresponding power associated with the muscles in that region."

"In my experience," Tim adds, "the length of the cannon bone front and rear is something that won't change with age. I think horses are born that way. It seems that horses that are high-hocked stay that way and they never get pretty and strong across their backs."

In a young horse that is croup-high, however, that extra height might not be due to excessive length in the cannon bones and could change with growth.

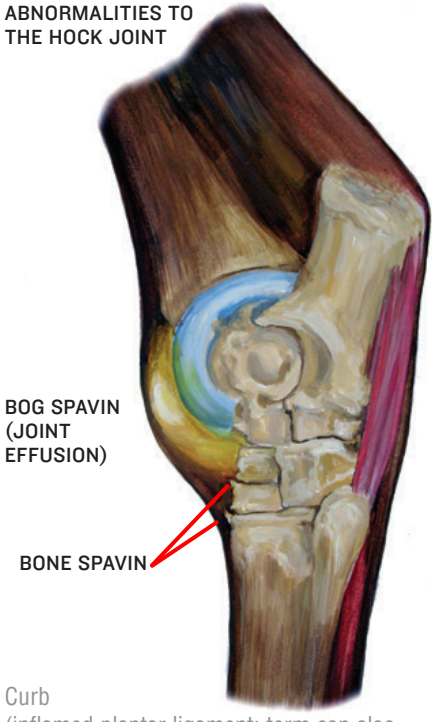
little angle in the hock are said to have "straight hocks." In those horses, the plumb line comes down from the point of the buttocks but doesn't touch the hock or the back of the cannon bone. The cannon bone is straight, perpendicular to the ground, but the angle of the hock between the cannon and the gaskin is slightly more open, setting the hind limb ahead of the plumb line.

An excessively straight hock is called a "post hock" or the horse is said to be "post-legged."

"You want a horse to be able to push forward, extend his limb far behind himself and then gather himself back up, flexing to reach forward again," Dr. Black describes. "If a horse has a very straight angle from hip to stifle and stifle to hock, he is not able to flex that limb and won't extend as well behind when he contracts the heavy muscles of the thigh and gaskin; the horse has a shorter stride."

Tim Finkenbinder agrees: "The hock is designed to flex and bend backward. To me, when a hock starts getting too straight is when you look at that hock joint, and it's so up and down it's hard to visualize it bending backward.

"That horse is not going to be able to get up underneath himself and maneuver himself in any challenging performance situation.



Curb
(inflamed plantar ligament; term can also apply to problems with other soft tissue structures in this location)

"In my experience, a tell-tale sign that a hock is too post-y is that the horse will start getting very soft in his back pasterns. If the horse has no give in his hock, the limb has to give somewhere, and it will be in his pasterns.

"That entire bone column puts more pressure on the ankle because that's the only joint giving, and eventually that horse breaks down in his back pasterns. That's the only joint doing its job."

Problems with too little angle in the hock can lead to bog spavins, a synovitis caused by chronic distension of the upper hock joint.

"As a judge, a bog spavin is similar to a splint," Tim says. "It's a red flag that will make me study the conformation of that horse a little closer. I want to see if there is a conformational fault (like too straight hocks) causing it; if there's not one, it might be from injury and I won't penalize him as much."

Form to Function

Tim sums it up: "What we're looking for is a happy medium in how a hock sets, in relationship to how it affects what the horse has to do. We want to stay away from horses that are excessively post-legged and horses that have excessive set to their hocks.

"The in between is what we're looking for."

CAMPED OUT

Some horses stand "camped out behind," where, standing square, the entire hind limb sits behind the point of the buttocks. The cannon bones are perpendicular to the ground, but the plumb line goes through the hock and down through the cannons, instead of running along the back side of them.

"We don't see that in the Quarter Horse like we do the sickle-hocked horse," says Dr. Black. "Unlike the sickle-hocked horse, a horse that is truly camped out has some restriction in his ability to flex and get his legs underneath himself, but he doesn't have quite as much arthritic problems as the sickle-hocked horse."

If you stretch a sickle-hocked horse out, he can appear camped out behind. But if he's standing square, his leg rests in the sickle shape.