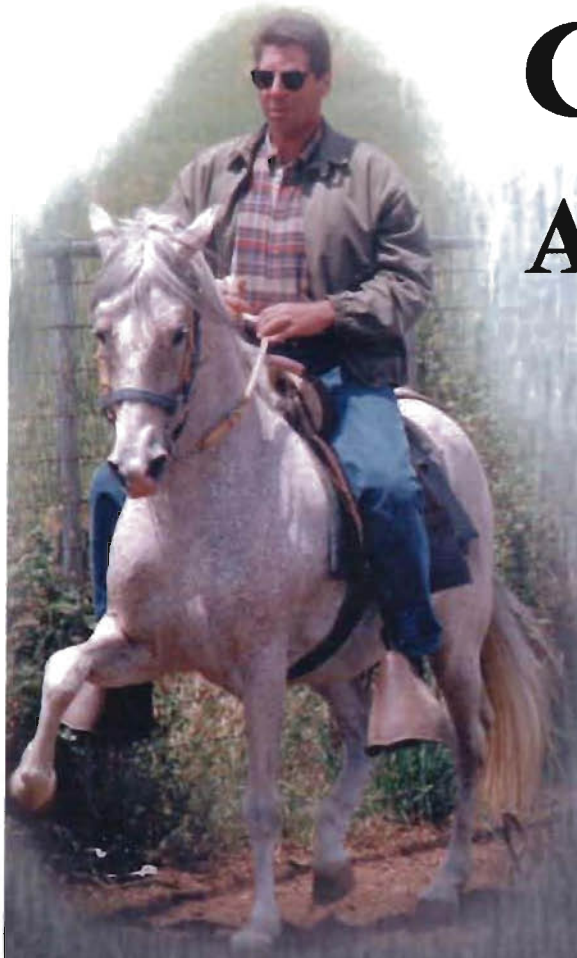
Conformation and Gait

by Lee Ziegler



Special thanks to all those who allowed me to stick tape on their horses and photograph the results!

Wouldn't it be wonderful if you could tell by looking at a horse's bone structure what gait he prefers?

To choose the perfect individual for a specific gaited breed, you could simply select the one with the right proportions for that gait. Think how simple breeding and training would be!

Seductive as the thought may be, conformation can only offer part of the answer when it comes to the question of a horse's gait preference. A horse moves in any gait as a result of the combination of

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COMPARING THE EXTREMES: PACER AND TROTTER

PACER: *Gypsy*, owned by Katherine Utke

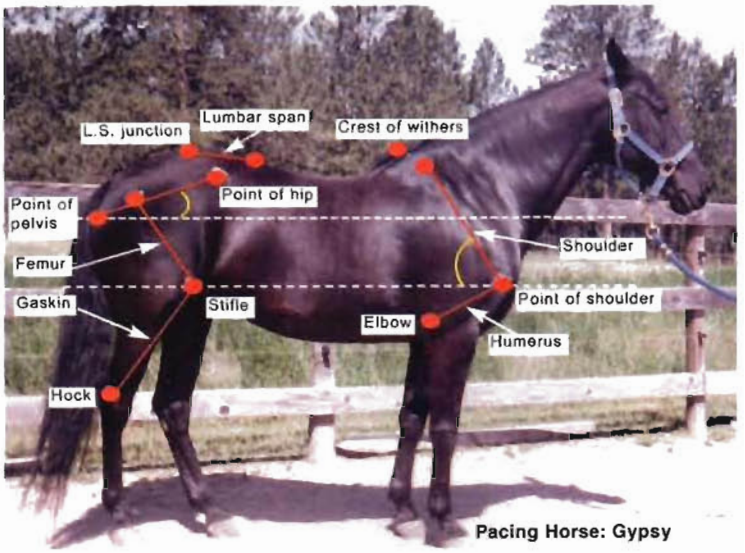
QUARTER HORSE: *I am Sonny*, owned by Katie Roberts-Hoffman

Back: The functional back of the pacer is much longer in relation to her body length than that of the trotting horse. Her lumbar span is also longer in comparison to her functional back than his. In addition, her lumbo-sacral junction lies farther behind the point of her hip than his. Her back appears to sag downward in ventroflexion as she stands still. His back is much higher (less swayed) between withers and croup.

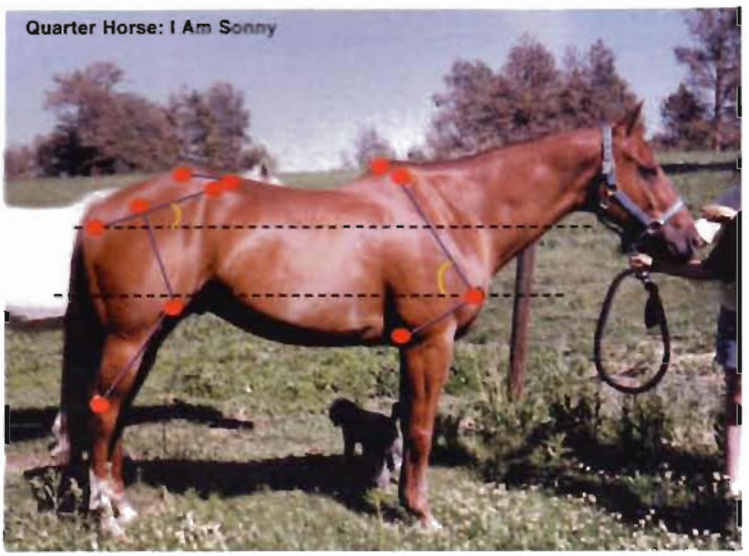
Hip: The trotter has a very long hip in proportion to his body length, about 30 % of his body length. The pacey mare's hip is much shorter in proportion. Her hip socket lies closer to her tail than does his. Her pelvic angle is steeper than his, although neither horse approaches the extremes of ventroflexion or dorsiflexion. She is not significantly rump high (withers and croup are about even) but his croup is noticeably lower than the crest of his rather high withers.

Neck: Note that the pacey mare's neck is set on high, and is relatively short compared to her body length. The trotter has a more medium set to his neck, which is almost as long as his body from withers to tail.

Hind legs: Neither of these horses is camped out although in the photos neither has totally vertical hind cannons. The ratio of femur to gaskin in the trotting horse is almost exactly 1:1, while the gaskin of the pacey mare is significantly longer than the femur.



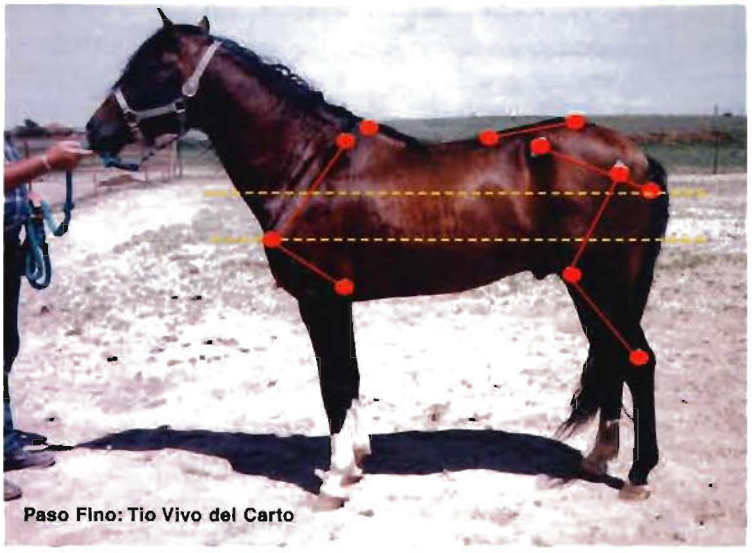
Pacing Horse: Gypsy

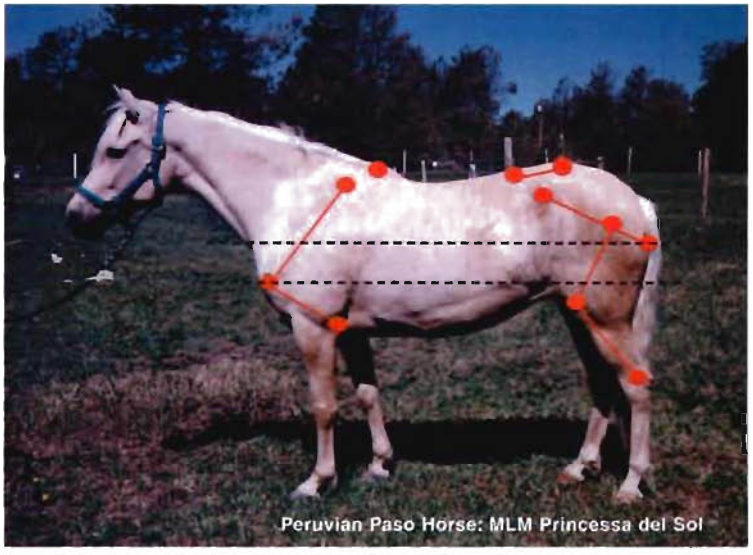

Quarter Horse: I Am Sonny

Quality of gait: Both of these horses have long shoulders. Hers is more upright, indicating that she would take a shorter step in front than he does. His is set much lower, inclining him to a long step. In addition, her humerus (from point of shoulder to elbow) is set more steeply than his, inclining her to higher action in front. He appears to have "daisy clipper" qualities, inclined to take long, low steps in front. Her hind leg conformation might incline her to overreach her step at the walk, while his inclines him to less overstride.

Gait preference: The Quarter Horse trots. He has no tendency to amble at the walk. His short lumbar span, long hip, and shorter functional back give him no inclination to travel in a ventroflexed position.The pacey mare can, with work and training, both rack and running walk, but her default gait is always the pace. Her long lumbar span, long functional back, short steep hip and hip socket placement incline her to a ventroflexed position.

With these strong differences between the trotting and pacing horse in mind, consider the conformation of the gaited horses that are not inclined to pace.


Paso Fino: Tio Vivo del Carto


Peruvian Paso Horse: MLM Princessa del Sol

THE PERUVIAN PASO: *MLM Princessa del Sol*, owned by Dave and Glenda Sena

Back: Compared to her body length, the functional back of this Peruvian mare is longer than that of the Quarter Horse, but not quite as long as that of the pacey mare. Her lumbar span is a bit shorter in proportion than that of the pacey mare and her lumbo-sacral junction lies almost as close to the point of her hip as does that of the trotter.

Hip: The hip of this mare is significantly shorter than that of either the Quarter Horse or the pacey mare. The angle of her pelvis is steeper than that of the pacey mare, much steeper than that of the Quarter horse. Her hip socket is placed a bit closer to the center of her pelvis than that of the pacer, but closer to the tail than that of the trotter. Her withers and croup are at almost the same height. The conformation in her hip is a balance between some traits that incline to ventroflexion and others that do not.

Neck: This mare has a long neck, almost the same length as her body from withers to tail. She carries it at a medium height.

Hind legs: This mare approaches a 1:1 ratio of femur to gaskin. She is not camped out.

** **Quality of gait:** This mare is built to take long relatively low steps in front (shoulder angle is relatively low, her humerus is long and tends to more horizontal than vertical.) Her hind leg inclines her to some overstride, but not as much as the pacey mare.

** **Gait preference:** This mare is a pleasure type Peruvian, who does a paso llano by preference. She is a nice blend of characteristics that incline to ventroflexion (long back, steep hip, rearward hip socket placement) and others that incline to dorsiflexion (long neck carried medium to low, 1:1 femur/gaskin ratio). She travels in a relatively neutral frame in gait. If she had more of the characteristics of the pacey mare and she would probably prefer a sobreandando.

THE PASO FINO: (Shown in performance, not fino, this horse performs a good largo/rack and can be used as an example of racking conformation as well.)
Tio Vivo del Carto, owned by Hank Kuiper

Back: The functional back of this horse is long in proportion to his body length, a bit longer than that of the pacey mare. His lumbar span is also longer than hers and much longer than that of the trotter. His lumbo - sacral junction lies far behind the point of his hip.

Hip: This stallion's hip is a bit longer in proportion to his body than his Peruvian cousin's. His pelvic angle is less steep than hers, but still steeper than that of the trotting horse. His hip socket is placed at about the same location on the pelvis as that of the pacey mare. His croup and withers are about even.

Neck: This horse's neck is shorter than his body from withers to tail, and it is carried high, even at rest.

Hind legs: The ratio of femur to gaskin of this horse is close to 1:1. He is not camped out.

****Quality of gait:** The relatively upright and long shoulder of this horse, combined with a short and upright humerus incline him to take short, high steps with his front legs — a desirable trait in a Paso Fino. His hind leg conformation inclines him to little overstride, another desirable trait for his breed.

****Gait preference:** The mixture of physical characteristics in this horse incline him to a very strong corto and medium speed largo. He blends some conformation traits that incline to ventroflexion (long lumbar span, hip socket placement, neck short and upright) with others for dorsiflexion (his hind leg placement and femur/gaskin ratio). He does not show any inclination to pace, but at times move in a pasitrote or trocha.

Continued on next page

Back: This mare's functional back is long compared to her body length when compared to the Quarter Horse, but shorter than that of the pacey mare and the Paso Fino. Her lumbar span is much shorter than that of the Paso Fino or the pacey mare but not at short as seen in the Quarter Horse. Her lumbo-sacral junction lies close to the point of her hip, about the same as that of the trotter, much closer than that of the other gaited horses.

Hip: Compared to her body length, this mare's hip is a bit shorter than the pacey mare's and much shorter than the trotter's. Her pelvic angle is about the same as that of the pacer. Her hip socket is placed a bit closer to the center of her pelvis those of the pacer or the paso horses, but farther back than that of the Quarter Horse. Her croup and withers are approximately the same height.

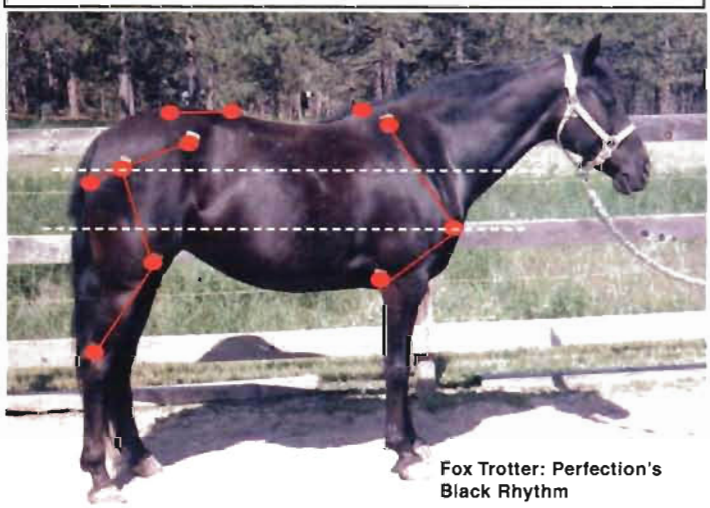
Neck: This mare's neck is longer than that of the pacer, but shorter than that of the trotter. It is set at a medium height, comparable to that of the Peruvian.

Hind legs: This mare is longer in the gaskin than the femur. While not camped out, her hock does lie farther to the rear than that of the Quarter Horse.

****Quality of gait:** This mare his a relatively upright shoulder and a long relatively horizontal humerus. She does not have either long natural reach or a high step in front. Her hind leg conformation (short femur/longer gaskin ratio) incline her to overstride her front steps.

****Gait preference:** While this mare can fox trot, running walk, pace and hard trot, her preferred gait is a fox trot. The mix of relatively short lumbar span, long back, shorter hip but central socket placement and hind leg short femur/long gaskin ratio allow her to both dorsiflex and ventroflex to some degree. The result is the least ventroflexed of the easy gaits, the fox trot.

THE FOX TROTTER: Perfection's Black Rhythm, owned by Katherine Utke



Fox Trotter: Perfection's Black Rhythm

Back: The functional back is long when compared to the trotting horse, but about the same as the Peruvian's. His lumbar span is shorter than the Paso Fino and Fox Trotter, but longer than the Quarter Horse. His lumbo-sacral junction lies farther behind the point of his hip than that of the Peruvian or Fox Trotter, but closer than that of the Paso Fino or pacer.

Hip: Compared to his body length, this horse's hip is longer than those of the other gaited horses, much longer than the pacer, but not as long as the Quarter Horse. His pelvic angle is more horizontal than the other gaited horses, although not as flat as the trotter. His hip socket lies closer to the point of his pelvis than the Quarter Horse's, at about the same location as the Fox Trotter's and Peruvian's. His croup and withers are even, or the Peruvians croup is slightly lower.

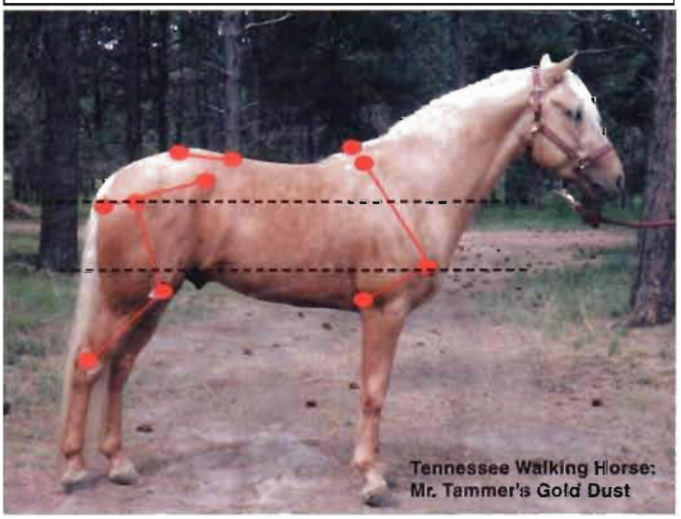
Neck: His neck is almost as long as his body (withers to tail), close to the proportion of the Peruvian, and longer than the other gaited horses or the pacer. It is set medium/high, but not as high as the Paso Fino's.

Hind legs: This horse is somewhat longer in the gaskin than the femur. He is the closest to camped out of the horses pictured, but still falls within the acceptable range in that the center of his hock does not lie behind the point of his buttock.

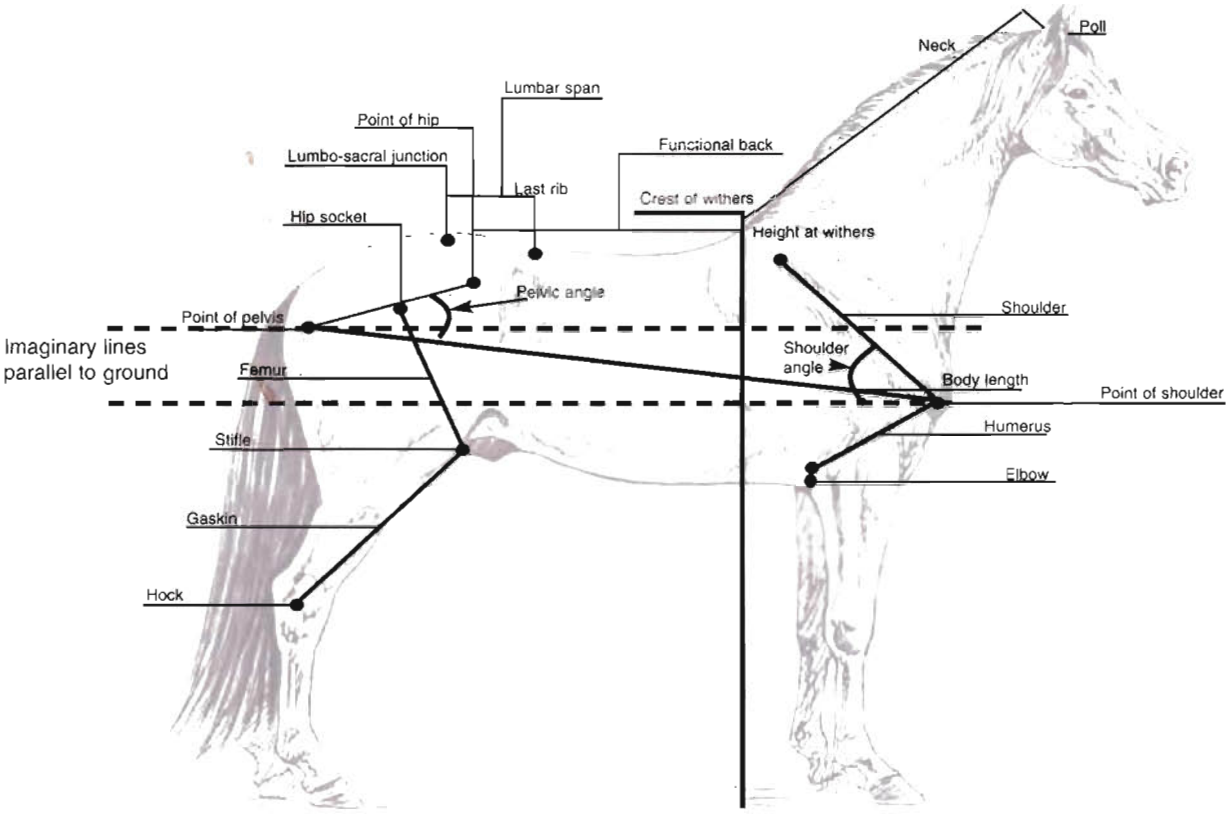
****Quality of gait:** His shoulders indicate that this stallion has medium reach, but takes higher steps than the Quarter Horse or Peruvian. He should be able to well overstride his front track, since his hind legs are built for reach. (Short femur, long gaskin)

****Gait preference:** This horse running walks. His long functional back and fairly long lumbar span incline him to ventroflexion, while the length and angle of his hip allow him to avoid a hollow position. His relatively long neck helps him balance and travel in a neutral position necessary for the running walk.

THE TENNESSEE WALKING HORSE: *Mr Tammer's Gold Dust*, owned by Rob McCartney



Tennessee Walking Horse: Mr. Tammer's Gold Dust



VENTROFLEXION

The back:

- Length of total functional back (withers to lumbo-sacral junction) is more than 45% of the body length.
- Length of the lumbar span (lumbar vertebrae from last rib to lumbo-sacral junction) is more than 40% of the functional back.
- The lumbo-sacral junction lies significantly behind the point of the hip.

The hip:

- The hip is less than 25% of the body length of the horse — displacing the hind leg to the rear and preventing lowering of the hindquarters from the lumbo-sacral junction.
- The hip socket lies closer to the tail than the center of the pelvis.
- The pelvic angle is shallower than 20 degrees or steeper than 45 degrees. A level pelvis is more difficult to engage under the horse by flexing downward at the lumbo-sacral junction and a steep pelvis is usually seen with camped out hind legs.
- The croup is higher than the withers. (Rump high) Often a result of hind leg (femur, gaskin, cannon) more than 15% longer than the height of the horse at the withers.

The neck:

- Short upright neck (poll to withers), much shorter than the functional back, limits the horse's ability to balance. An upright, or ewe neck, inclines him to hollow his back.

The hind legs:

- Femur much shorter than gaskin. A 1:1.3 or higher ratio inclines to ventroflexion because it is difficult for a horse to lower his hindquarters from the lumbo-sacral junction with this type of hind leg. This type of hind leg will usually be camped out — with the hind cannon vertical, the center of the hock will lie significantly behind a plumb line dropped from the point of the buttock

[*Any horse with all of the traits of ventroflexion would be a very sorry looking animal!*]

Of these traits, those most important to a horse's ability to do easy gaits are the length of the functional back and the lumbar span. These weight-bearing parts of the spine are most likely to sag into extreme ventroflexion if they are very long, and to rise into dorsiflexion if they are short. It is in the back that the tale of the gait is most often told.

DORSIFLEXION

The back:

- Length of the total functional back is less than 39% of the body length.
- Length of the lumbar span is less than 35% of the total functional back.
- The lumbo-sacral junction lies close to the point of the hip.

The hip:

- The hip is between 30% and 40% of the body length of the horse.
- The hip socket lies close to the center of the pelvis.
- The pelvic angle is approximately 20 to 25 degrees.
- The croup is even with the withers or slightly lower. Hind leg length is close to the same as the height of the horse at the withers.

The neck:

- A neck set on at medium height, ideally as long as the distance from withers to tail, improves balance and ability to round the back.

The hind legs:

- Femur the same or longer than the gaskin. In many upper level dressage horses which must move in extreme dorsiflexion, the ratio may be 8:1. With the hind cannon vertical, the center of the hock or the back of the hock joint lies directly under a plumb line dropped from the point of thepelvis.

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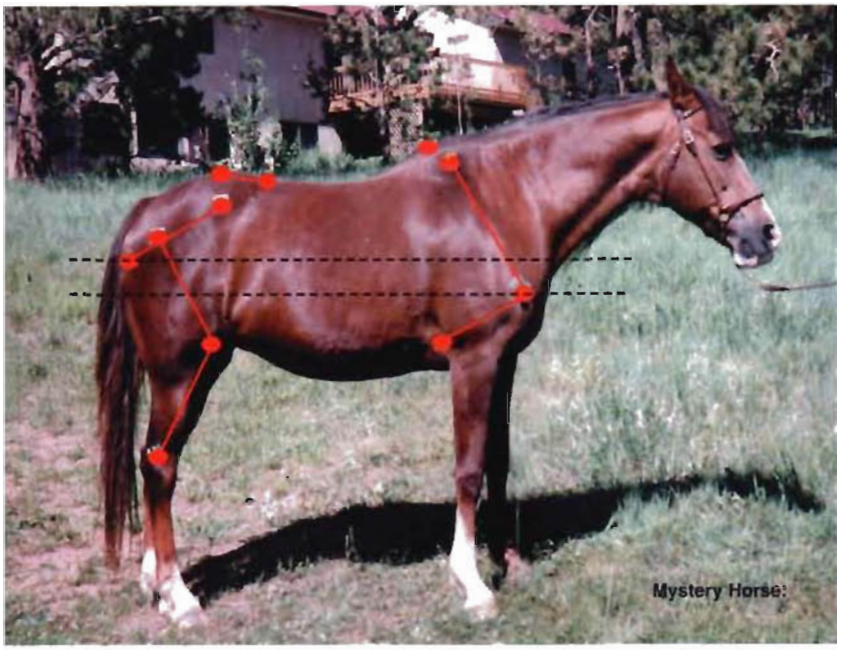
Mystery horse:

Armed with an idea of what conformation combinations produce which gaits, look closely at this mare. What gait do you suppose she does? (Yes, she is a gaited individual.) Can you see the proportions of back and hip that incline her to the gait?

Now go look at your own horse and see if you can find the traits of ventroflexion blended with those for dorsiflexion that incline him to his gait.

For The Answers see page 64



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his bone structure, muscle development and nerve patterns.

Some types of bone structure will predispose a horse to certain body positions, and those body positions will in turn incline a horse to certain gaits. However, a horse can modify his basic body position by the use of his muscles. He may inherit a particular bone structure, but what he does with it depends on his physical condition and the development of his nervous system. This is true both of characteristics that incline to certain gaits, and to others that effect the quality of those gaits.

So, is bone structure a good indication of a preferred gait? There are obvious differences in bone structure between gaited and good non-gaited horses, and additional subtle variations among the gaited breeds. They may not correlate 100% to the gaits of choice of these horses, but they can give a good idea of whether an individual is capable of a particular easy gait and the style in which he will perform it. Conformation is not the sole determinant of gait, but it is a major contributing factor.

"FRAME" AND GAIT

Anyone who has ridden both gaited and non-gaited horses in a light saddle or bareback eventually discovers that the way the horse's back feels changes from gait to gait. The noticeable variations in the back are a direct reflection of the body position or "frame" the horse uses in each gait. This position ranges from extremely hollow in the hard pace to extremely round, or basculed, in the collected trot. Although some horses will trot in a hollow position, none will pace in a rounded one. A horse physically cannot work in an easy gait with a rounded frame — that is a sustained downward flexion of the lumbo-sacral junction, a raised back, increased flexion of all the joints in the hind legs (hip, stifle, hock, hind fetlock) and a raised root of the neck at the withers. He may work in a shortened frame as does a Fino horse, but he will not achieve the same frame as a basculed horse. If he did, he would trot.

Horses working in a hard pace or stepping pace travel in the most hollow frame. Those in a rack or corto /largo are slightly less hollow. Those that work in a running walk lose most of the hollow in their backs and travel in a neutral frame, neither hollow nor rounded. Horses that fox trot work in the least hollow position of any of the easy gaits, just a bit more rounded than those in the running walk. All of these positions are influenced by bone structure.

OF VENTROFLEXION AND DORSIFLEXION

In biomechanical terms, the positions used in the different gaits involve degrees of ventroflexion (concave curve) or dorsiflexion (convex curve or bascule.) Certain bony conformation traits incline a horse to ventroflexion, or to dorsiflexion. These have been identified by Dr. Deb Bennett (and others) and, unlike nerve and muscle composition, are observable in living horses.

Horses that perform the easy gaits always have some physical proportions that incline them to ventroflexion, along with a few that incline to a dorsiflexed position. The gait they prefer is often, but not always, determined by how these traits are blended. Remember the importance of those "other" factors as you consider conformation in relation to gait.

QUALITY OF GAIT

In addition to inclining a horse to a particular body position, conformation can also contribute to the type or quality of the preferred gait. The shoulder/humerus assembly determines whether the horse will take a long, low step or a high short one with his front legs. The more laid back the shoulder, the longer and

lower the step of the horse. The higher the shoulder angle and the shorter and higher the humerus, the more likely the horse will be to have a high, short step.

Hind leg conformation determines how much the horse can overstride his front track. A relatively short and straight hind leg will allow the horse to dorsiflex, and to thrust himself forward efficiently with less possibility of injury to his hocks (spavins, curb, etc.) A relatively long and angled hind leg allows the horse to reach forward and to track up or overstride easily. However, if the hind leg is too long and angled, the possibilities of joint injury increase. A happy medium between the two produces a horse that stays sound and still can overstride, if desired.

DIFFERENCES BETWEEN BREEDS:

Each of the gaited breeds is expected to be a specialist in a particular easy gait. It should follow that the conformation of these horses will be as different as the gaits they are expected to perform. Fox Trotters, performing in the least ventroflexed position should differ somewhat from Tennessee Walkers which move in a more neutral position and both should differ significantly from the Paso horses that perform the most ventroflexed of the easy gaits. All should differ from horses that prefer to pace or hard trot. Do they?

The answer is — sometimes, in some ways. The following photos were taken of various horses living within a 5 mile radius of my home. They are pretty typical representatives of their types. Some have been shown, some are pleasure horses, all except the pacer perform the accepted gaits of their respective breeds with no specialized shoeing. They were photographed with tape markers placed at approximate locations of significant conformation points. The tape and dots are located over : the crest of the withers; the top of the shoulder; the point of the shoulder; the elbow; the last rib; the lumbo-sacral junction; the point of the hip; the hip socket; the point of the pelvis; the stifle and the hock.