Balancing Hoof

By Jaime Jackson

In the conclusion to this three-part series, the author outlines solid ideas on how you can do a better job of balancing the hooves of your client's horses.

In THE previous two parts of this series, I spelled out my thoughts and the scientific principles involved in properly balancing hooves.

The hoof size and proportion data I gathered provides a limited view of hoof balance. But what we can "see" of it through the data in terms of statistical interpretation helps us better understand our mission as hoof care providers.

A complete delineation of my findings lies outside the scope of this paper, so this brief summary describes the form of the naturally shaped and balanced hoof. As a result, I caution you not to seize the numbers—particularly the statistical averages—and use them categorically as a precise prescription for trimming your client's horses.

They are presented here so you can better understand and appreciate the relationship between form and force as they converge in the naturally worn, balanced hoof of wild horses.

I use them only as rough guidelines to keep me on track and to let me know if I'm working within nature's grand plan. After all, that's why I went out to wild horse country in the first place.

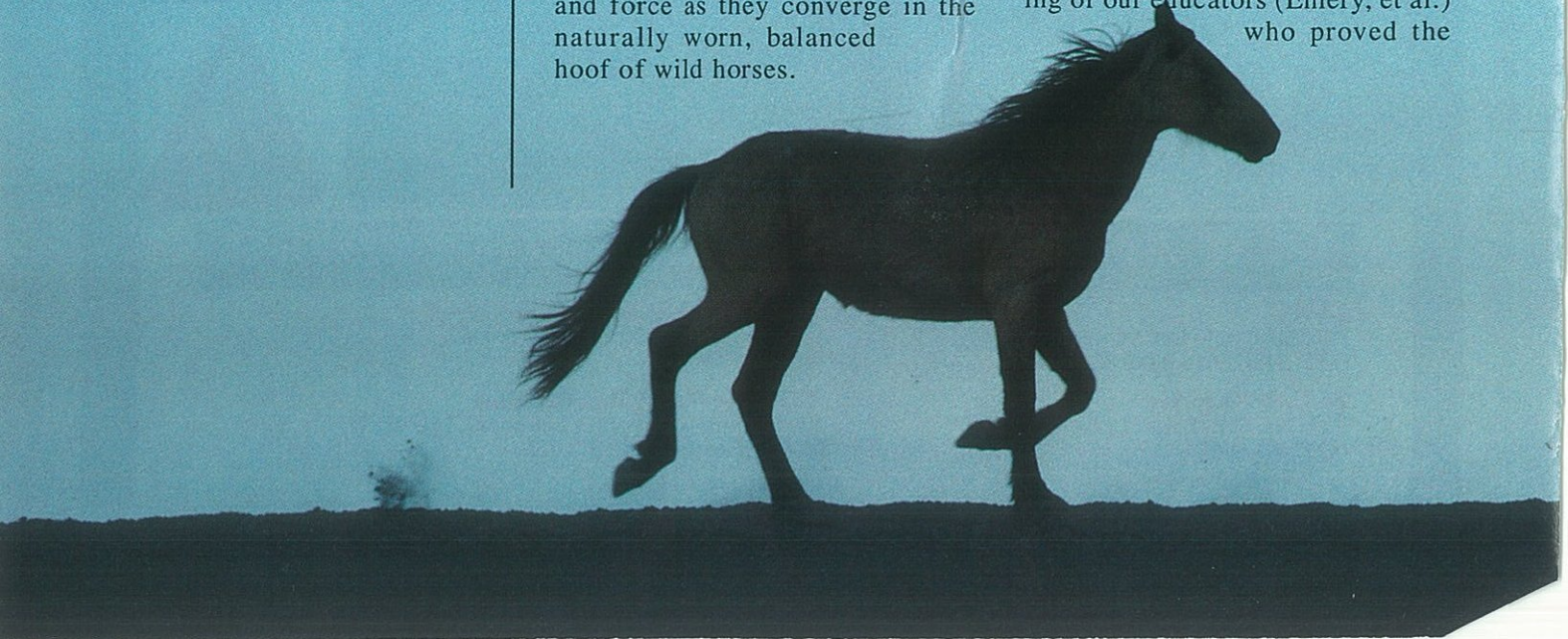
Really effective application of my findinds must await further discussion, research, education and technical innovations.

Angle Of Growth

Figure 1 illustrates the angle of growth of the naturally balanced hoof in two profiles.

From the front, the grain of the horn appears to align perpendicularly to the ground. The hoof specimens show some wavering in the grain. By and large, the grain is set at right angles to the ground.

I believe the horn grows this way to coincide with the hoof's angle of impact (Figure 2). This makes sense following the reasoning of our educators (Emery, et al.) who proved the



Size With Proportion *naturally*

hoof's strength when the ends of the grain are oriented such as during impact.

From the side, the angle of growth varies from toe to heel—being higher at the toe and progressively less toward the heel. But in the naturally shaped hoof, the radius of the hoof wall lies at a higher angle at the quarter and heel than at the toe. Conceivably, this conformation compensates for the lower angle of growth observed in the posterior half of the hoof wall.

Symmetry/Asymmetry

The naturally shaped hoof's median line bisects its volar profile through the central sulcus of the frog. If this line were extended up, around and into the anterior profile of the hoof, it would divide but not necessarily bisect the same hoof.

As can be seen in Figure 3, front hooves tend to be bisected by this median line.

By contrast, hind hooves tend to be divided disproportionately. When the division occurs as a bisection, I refer to the hoof as symmetrical in relation to its median line. If the division occurs disproportionately, the hoof is designated as asymmetrically shaped.

Another dimension to symmetry and asymmetry is revealed when we contrast the hoof's angle of growth with its median line as observed in the volar profile.

Figure 4 shows the angle of growth of the front hoof tends to align with its (volar) median axis. This is not so with the hind hoof where the two tend to intersect.

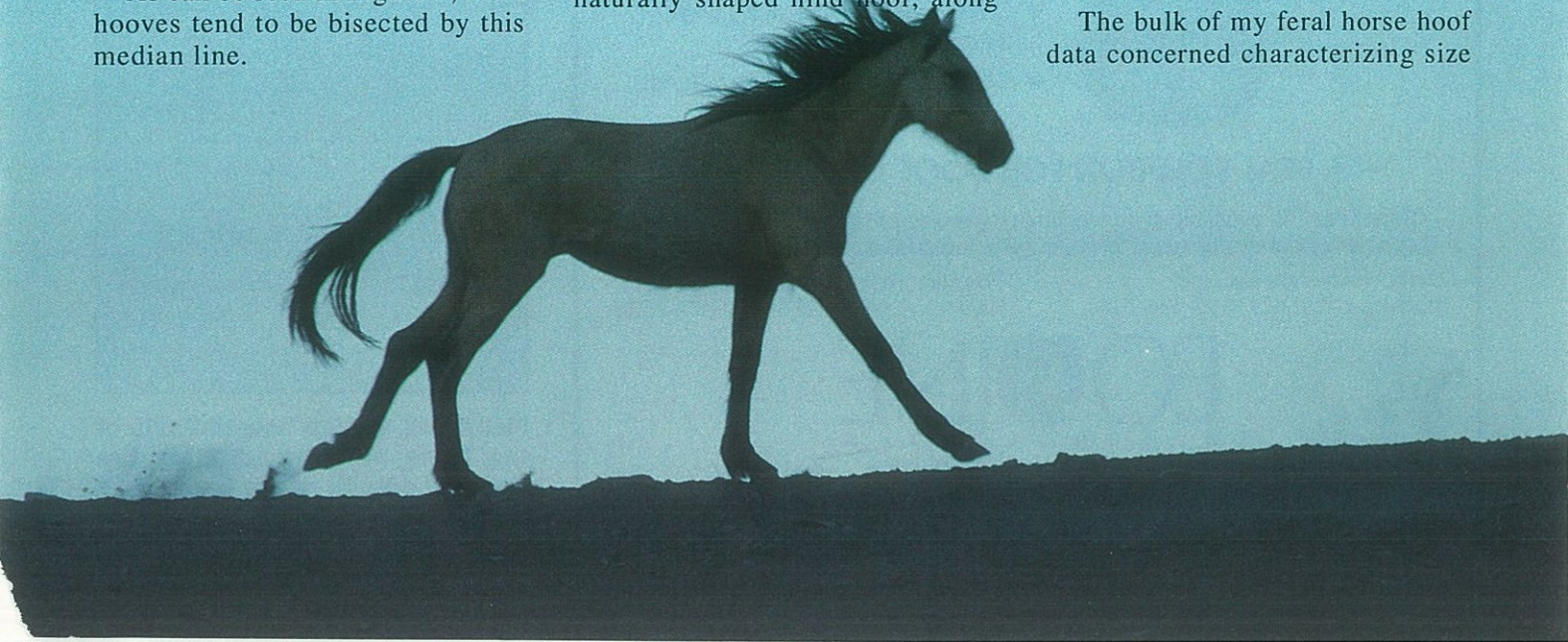
These fundamental differences of symmetry and asymmetry coincide with the locomotive propensities of the front and hind legs. The narrow toe configuration of the naturally shaped hind hoof, along with the hind leg's abundance of semiflexor joints, seems propitiously designed for lateral thrust. In this regard, its asymmetric orientation—which appears to put the digit more over the medial side of the hoof—seems consistent with this (Figure 5).

Conversely, the relatively round front toe configuration with numerous bracer joints seems to provide support rather than lateral thrust.

Only carefully drafted research can explain these apparent relationships. For example, there may be a correlation between angle differential between front and hind hooves (Figure 6, T° H - T° F) and the latter's angle of asymmetry. If this is so, it would be prudent to learn why.

Size And Proportion

The bulk of my feral horse hoof data concerned characterizing size



and proportion. This meant creating a statistical "bell curve," a mathematically derived curve that tells us what is average (a statistical "mean") for a sampled population and also how various measurement data are distributed around that average (called "central tendency").

The statistician I consulted assured me the bell curve was an honest one which could be used to interpret my findings (Figure 6). The numbers provide the averages or means and the magnitudes of variation (based on units of standard deviation) from the means for the various measurement categories which I sampled and tested.

As can be seen, hooves of adult feral horses range widely in size and proportion. Toe angles averaged approximately 55 degrees for front hooves and 58 degrees for hinds. Toe lengths for front and hinds both averaged about 3-in. Use the data to check other hoof dimensions and their statistical evaluations.

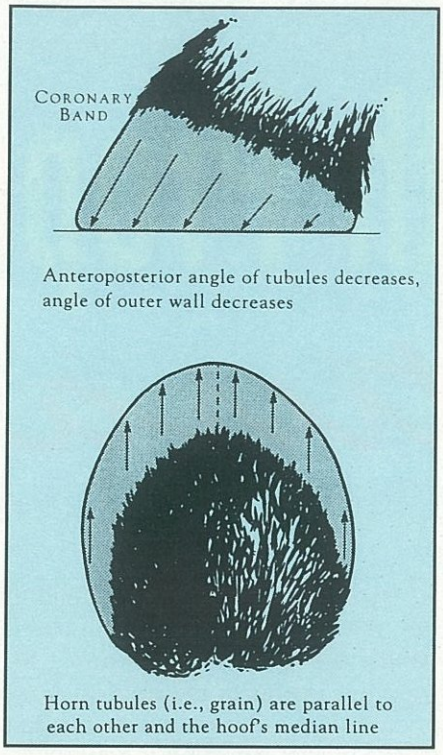


FIGURE 1. The hoof wall grows down and forward from the coronary band to the ground at the same angle of the foot's toe wall.

The "Farriers Beltline"

I have drawn a circle around the central portion of the bell curve to draw attention to a good working range for regulating hoof size and proportion among most domestic horses (excluding pony and draft breeds, whose bell curves must be qualified). I call this the "farrier's beltline."

Most domestic light horses can probably be trimmed to fit in the beltline without much trouble. However, my experiences show a relative few animals will fall outside this range.

A complete analysis of my recommended approach for trimming and balancing a hoof within the beltline technically lies beyond the scope of this paper.

In part, my recommendations involve reducing the hoof to what I call the "work plate"—a minimum of hoof growth that lies within the beltline, but not within sensitive tissues.

I am also a strong advocate of promoting barefootedness. Such a hoof care program attempts to toughen and thicken the hoof's support bearing surfaces, but only in conjunction with alternative

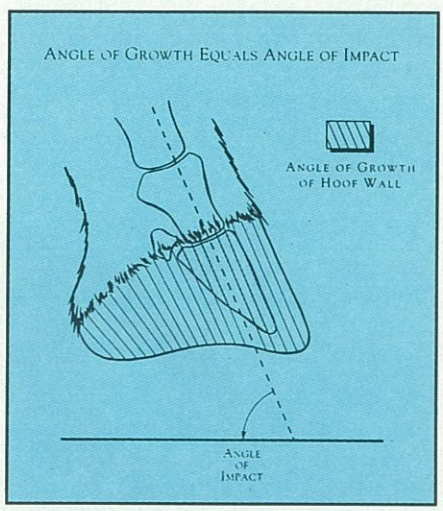


FIGURE 2. Notice how the axis of the bone column parallels the angle of growth of the toe and, in turn, the hoof's angle of impact.

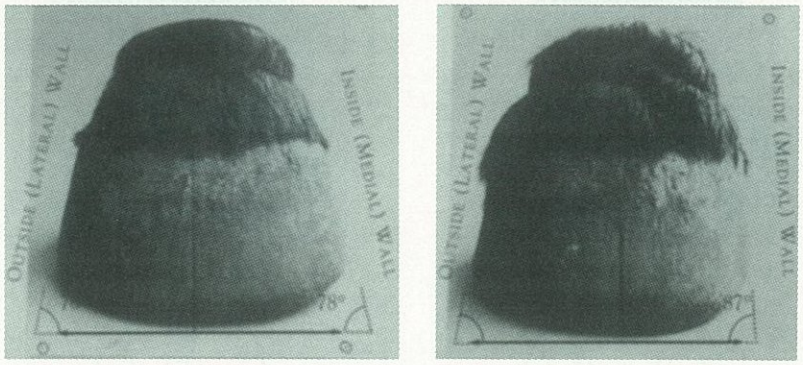
hoof protection that can be readily applied and removed by the rider or trainer when it is not needed.

The current level of available professional farriery and veterinary skills far exceeds levels needed to give a hoof the basic shape it requires to participate fully in the natural locomotive process. Yet I am dubious of the current technology with which we are compelled to labor.

As I envision tools and hoof protectors of the future, many different sounds, shapes and materials will be used. Shoes will look more like horse hooves, incorporating new and exciting materials most of us have never heard of. At the hoof, I expect less nipping, slicing and hammering along with more grinding, sanding and buffing.

By way of comparison, I am reminded of the computer and its typewriter ancestor. Change is needed.

I have personally witnessed some very creative and promising innovations in our profession—the products of imaginative farriers



FRONT
ANTERIOR VIEW OF LEFT HOOF

HIND
ANTERIOR VIEW OF RIGHT HOOF

FIGURE 3. These pictures show basic front and hind naturally shaped hooves of a typical adult wild horse. It is important to know that nature intended front hooves to be shaped different than corresponding hinds.

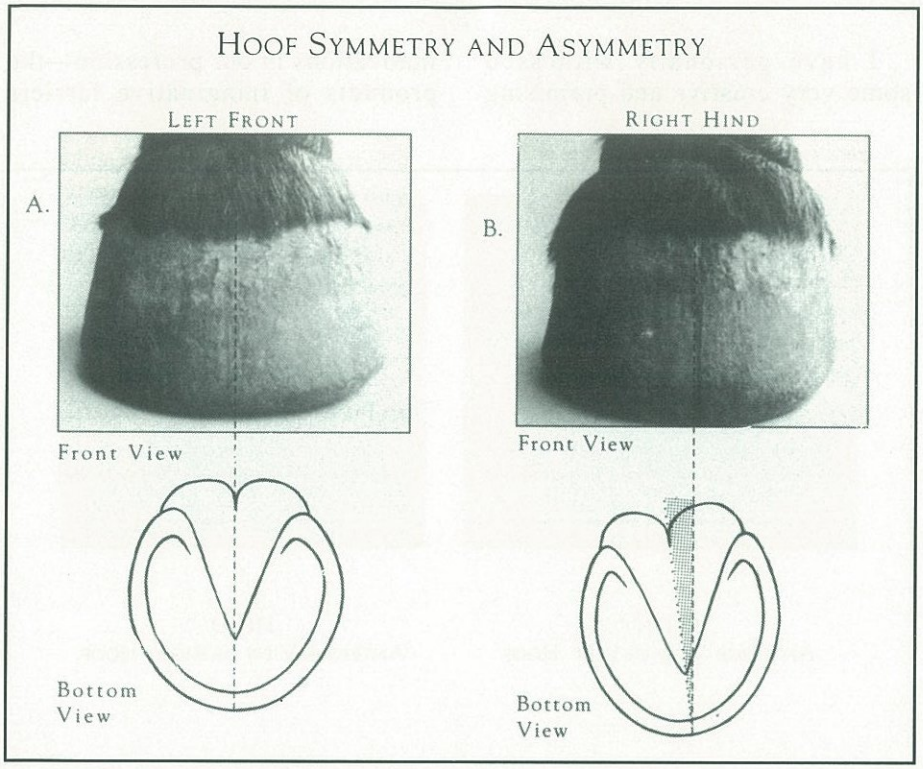


FIGURE 4. When examining hooves, the center line bisects the hoof when viewed from the front. The left side of the horse's hoof is clearly symmetrical to the right side, just like when it is viewed from below.

who want and deserve our audience. A mere glance at the *American Farriers Journal* reveals this flourishing of innovation in every aspect of our work.

Equestrian Connection

Foremost in the hoof care provider's mind may be the question: To what extent does the equestrian experience of the horse affect hoof shape and balance? The answer: It depends.

If the horse is shod with permanent hoof protectors (traditional shoes and nails), hooves continue to grow without wear. Unquestionably, they will soon measure outside the beltline.

By definition, hoof balance ceases to exist on the basis of excessive form alone. This propensity of the hoof is an important reason for my advocacy of a carefully calculated program of barefootedness augmented by state-of-the-art temporary (removable) hoof pro-

tection administered by a qualified hoof care professional.

The likelihood of hooves measuring outside the beltline adversely impacting the natural action of the semiflexor joints is virtually guaranteed. Where the rider has no competency concerning the art of balanced riding, any already ill effects upon the joints can only be compounded.

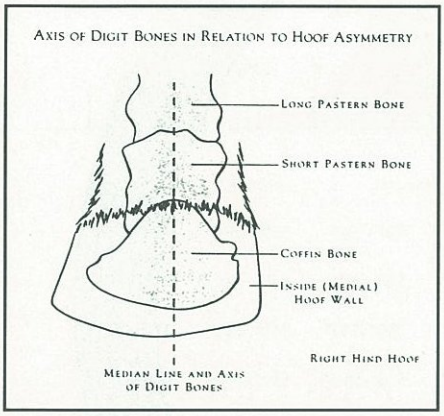


FIGURE 5. The asymmetrical division of the hind hoof puts the inner side of the hoof more closely under the axis of the limb's bones.

The question arises as to what impact imbalanced riding might have on hooves shaped consistently and naturally within the beltline.

According to natural state theory, the impact would be adverse—even if the farrier could hold the hooves to a reasonably natural size.

The problem lies within the force component of hoof balance since reciprocal damage to hoof form is predictable at the other end of the equilibrium. Research shows insidious transformation of the hoof capsule of naturally shaped hooves could be induced even if the hooves continue to measure within the beltline.

In the short term, a breakdown in the natural gait complex would probably lead to problems of the joints and attending musculatures. Even so, imbalanced locomotion can imperil hoof balance.

On the brighter side, the outlook of our natural riders and their well-trained, four-legged companions will surely shine brightly, knowing the hooves beneath them have been sculpted to fit their equestrian goals.

Even here, education will be in the hands of the farrier, as who will know better than the quintessential hoof master? An immediate message is that hooves kept within the beltline by the farrier will undoubtedly minimize problems with the synchronicity of the bracer and semiflexor joints.

A well-sculpted hoof plate, configured in the beltline, potentially reduces the likelihood of mechanically obstructive shoeing. It also virtually assures the natural rider

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Jaime Jackson is a farrier from Tilly, Ark., and author of "The Natural Horse" book.

of having balanced hooves.

More Research Needed

There is still a vast interior of the natural horse paradigm that needs to be studied by the equine research community. We need more observation, documented by appropriate film footage, of wild horse society. Photographers need to focus on the hooves and less on the pyrotechnics of equine life at the water hole and the grandeur of the high desert environment.

Animal behaviorists need to shift a portion of their attention briefly from neurotic confined behavior of the domestic horse and explore the richness of balanced equine life. Equestrian experts need to verify their assumptions about gait, the mechanics of the natural gait complex and biomechanics of equine/human convergence in the saddle. In fact, the list of possibilities by category is practically endless.

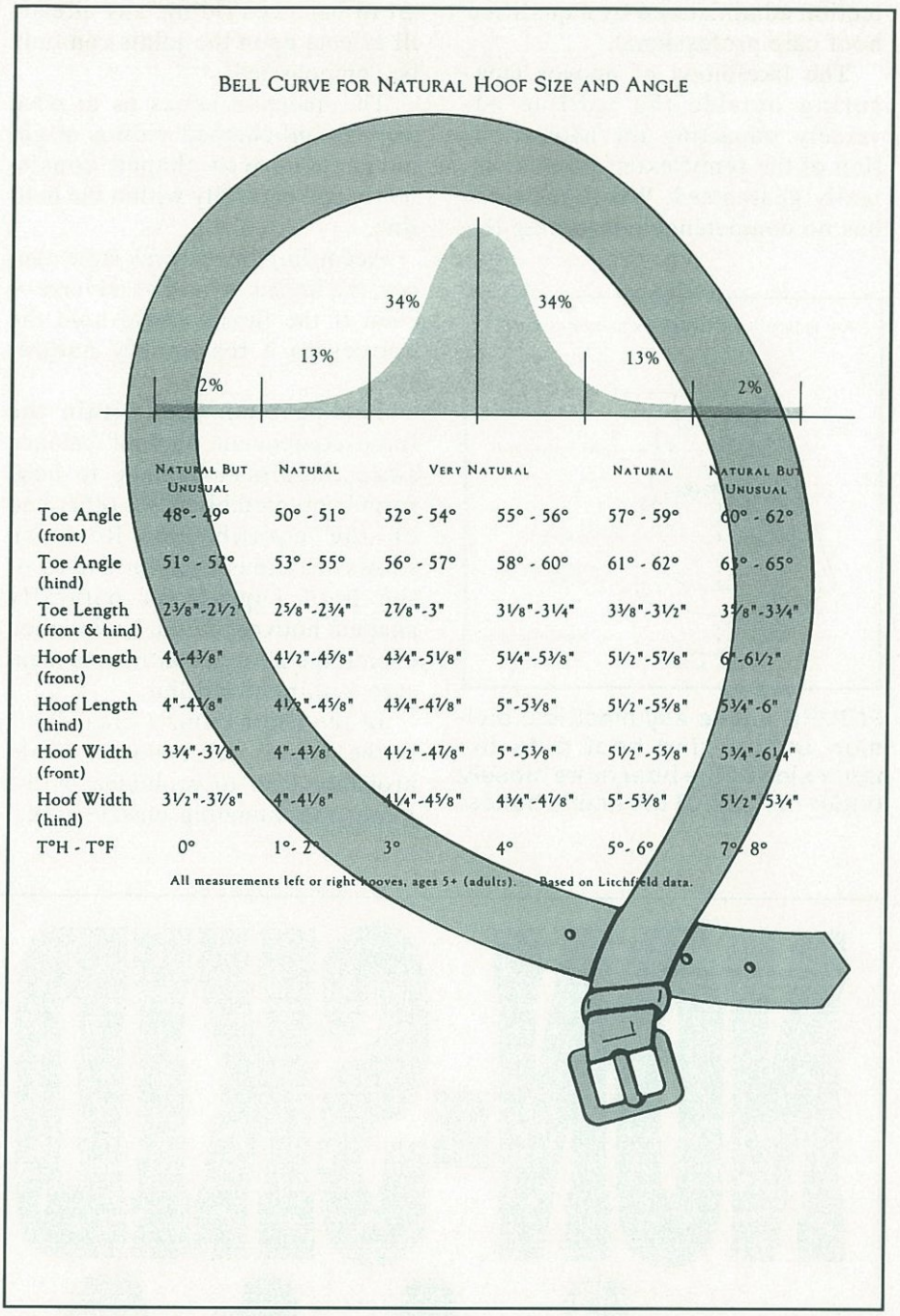

FIGURE 6. The bell-shaped curve is a simple, convenient way to compare averages and ranges for naturally versus unnaturally shaped hooves. Numbers listed below are designated in inches and degrees.

In hoof care management, much work still needs to be done. For example, the few measurement categories I have identified (there are many others) beg to be correlated to each other and to the locomotive force described in this paper. Let me speculate on one possibility.

Educators have long presumed an important relationship between the slope of the pastern and the angle of the horse's toe. In some textbooks, the angle of the horse's shoulder and hip joints have been included in this equilibrium. Why not factor into this relationship the force component of hoof balance?

Figure 7 illustrates one way this might be done. Let's say the rate of change in the angle of any given

semiflexor joint is a function of those mechanisms of the natural gait complex. Thus we can measure, observe or modulate stride length, cadence and speed.

If the size, shape, proportion and orientation of the hoof are equally quantifiable, why not correlate them? By recognizing the importance of the G-force, we could also factor in the weight of the horse along with its age.

Such an investigation would lead us directly to the door of unprecedented gait analysis. The combined, synergistic impact of toe angle, toe length and volar surface area (shown in the illustration as a circular function of several of the hoof's axes, weight, and age—not just toe angle, which could be very misleading) could be modulated in relation to the natural action of the horse.

Nature could conceivably reveal a more precise prescription for hoof manipulation from such an investigation. The potential for crossover from here to regulating hoof form in the battle against lameness is very conceivable.

Conclusion

Hoof balance as viewed from the perspective of natural state theory can be defined as an equilibrium or counterpoise between opposing forces that define and shape the hoof. The principal shaping forces are created by the natural locomotive process and are endured by the hoof.

Balanced form follows from balanced movement. At the same time, balanced form is essential if balanced movement is to endure.

The two are really inseparable. Form and force are thus the salients of hoof balance.

Nature provides for a dynamic equilibrium that unites them: A balancing act whose fulcrum represents the very spirit of the natural horse and a process which invites us all to its adventure.

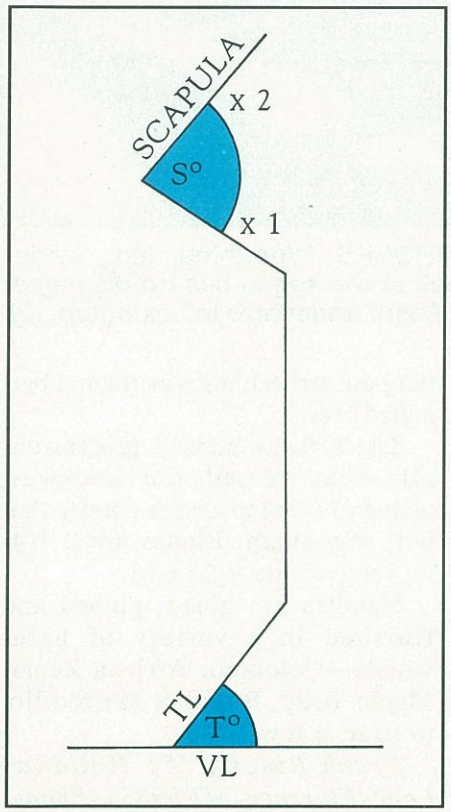

FIGURE 7. Some of our foremost educators have speculated about the relationship of hoof angle to shoulder/hip angle. Using natural state data for the hoof as a form standard, and the natural gait complex as a locomotive standard, this relationship could be tested. This type of research, when correlated to a horse's weight, height, and other hoof measurements, could possibly provide greater insight into prescribing natural hoof angles to the hooves of domestic horses.

Here's What You Missed In '94 "Farrier Product Parade"

Shoers at last winter's farrier conference were keenly interested in learning more about the "hot products" that would help their shoeing.

SHOES FOR HORSESHOERS. Woodbine, Md., farrier Kevin Meile takes a look at the keg shoes on display at the American Farrier's Assn. tradeshow in Lexington, Ky.

By Dave Ernst, Associate Editor

A FAVORITE FEATURE of the American Farrier's Assn. annual convention is always the Farrier's Industry Assn. trade show and the 1994 convention in Lexington, Ky., was no exception.

Plus, the Bluegrass Laminitis Symposium, held the week before in Louisville, provided farriers with many opportunities to preview the hottest shoeing products.

DIAMOND HOOF KNIVES

All Diamond hoof knives are made of high quality carbon steel blades coated with a rust-resistant black finish for long life and durability. Ergonomically designed handles provide exceptional comfort.

You can choose from four styles: right-hand narrow, left-hand narrow, right-hand wide and left-hand wide.

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Frank Ringel, 351 Holloway Lane, Florence, MT 59833. Phone: 406/273-0269.

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HORSESHOE BENDER

The Blacksmith Shop's hydraulic horseshoe bender is capable of bending shoes from 1/4 to 3/8-in. thick and 1/2 to 1/4-in. wide in unlimited lengths. You can bend a hot, straight piece of bar stock into a horseshoe in approximately 15 to 20 seconds with no hammer marks.

The bender now comes with dies