Form Follows FUNCTION

BY STEPHANIE HEDGEPATH

A CLOSER LOOK AT THE CANINE FRONT

SHOULDER ASSEMBLY, PART 1

As in all things "dog," the correct shoulder assembly varies from breed to breed. This variation depends upon the tasks the different breeds were developed to perform.

In a quick review, every dog has the same number and kinds of bones. What varies are the length of the bones and the angles at which they join, which differ from breed to breed—and also from dog to dog within each breed. Bones are the building blocks of structure. Bones are classified according to shape and function. One of the functions of the skeletal structure of the dog is to supply a sufficient area for the attachment of muscles. This is especially important with the shoulder assembly! Smooth muscles account for approximately one-third to one-half the total body weight. Ligaments hold bones together while tendons attach muscle to bone. Tendons are considered to be a part of the muscle structure, ligaments are not.

Since 60-75% of the weight of the dog is concentrated on the front (due to the head and neck), the front assembly of the dog is of vital importance to the function of the dog as a whole. Most of this weight is flexibly carried by the forelimbs, using muscles and tendons ONLY.

THE CANINE SHOULDER ASSEMBLY

The shoulder assembly is a complex interaction of bone, muscle and connective tissue, which includes the tendons and ligaments. I do not want to get into the controversy of the degree of angulation required in many standards; angles vary from breed to breed. As many have demonstrated with radiography, the true angulation of many (if not most) breeds isn't the 45-degree layback or the 90-degree angle formed with the juncture of the shoulder blade to the upper arm—but this is what we have to work with—and I cannot change the terminology. What I believe we need to do is leave the measuring devices at home so that we can train our eye to see the balance in the standing dog, and [learn] how to apply that to movement. What we should all have in common (no matter the breed) is the goal to produce a dog that can acquit its duties with the least amount of energy.

Figure 1. The German Shorthaired Pointer

Figure 2. German Shorthair Pointer showing skeletal overlay of the fore assembly.

THE GERMAN SHORTHAIRED POINTER STANDARD STATES:

'Forequarters: The shoulders are sloping, movable, and well covered with muscle. The shoulder blades lie flat and are well laid back nearing a 45 degree angle. The upper arm (the bones between the shoulder and elbow joint) is as long as possible, standing away somewhat from the trunk so that the straight and closely muscled legs, when viewed from the front, appear to be parallel.'

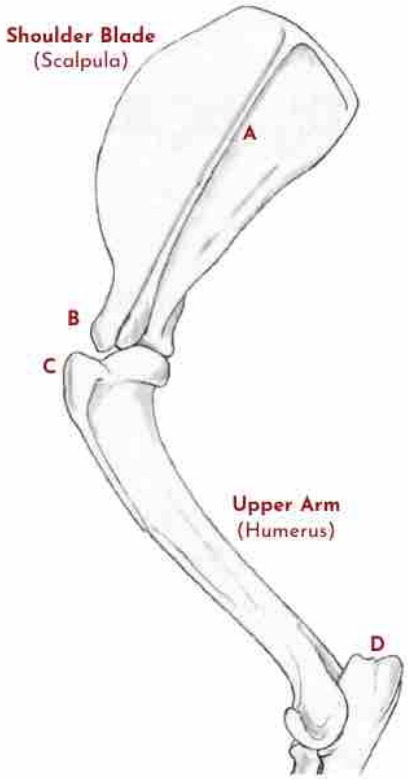

Figure 3. Landmarks of the Fore Assembly

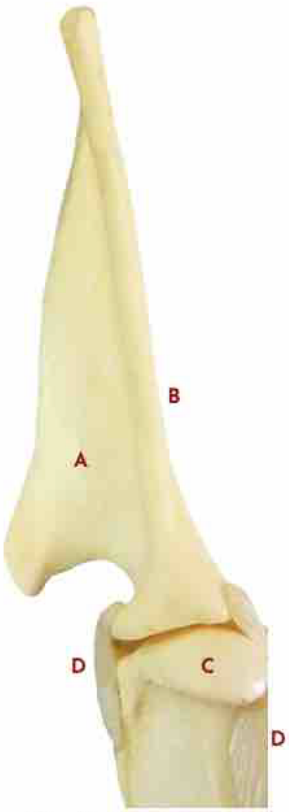

Figure 4. Shoulder Blade Profile

Figure 5. The Shoulder Blade (Scapula)

The German Shorthaired Pointer Standard states: "Forequarters: The shoulders are sloping, movable, and well covered with muscle. The shoulder blades lie flat and are well laid back nearing a 45 degree angle. The upper arm (the bones between the shoulder and elbow joint) is as long as possible, standing away somewhat from the trunk so that the straight and closely muscled legs, when viewed from the front, appear to be parallel."

The fore assembly of the dog is far more than just the shoulder blade (scapula), but it is this oddly shaped bone that serves as the foundation of the fore assembly. The bones of the skeleton form the armature—around and upon which the form of the dog develops. In my 50 years as a breeder (and also in my tenure as a conformation judge), I have come to the conclusion that the correct shoulder assembly for any breed is the hardest to come by and the easiest to lose.

The shoulder blade articulates with the upper arm via a shallow ball and socket joint. This angulation provides lever action in which the muscles exert force, allowing them to change their position thus producing movement of the leg, which in turn propels the dog forward. (See Figure 3.) The physical landmarks of the angulation of the shoulder to the upper arm that can be palpated on physical examination are: "A" Spine of the Shoulder Blade; "B" Supraglenoid Tubercle (defined as a nodule or small protuberance, especially one on a bone, for the attachment of a tendon); "C" Greater Tubercle of Upper Arm (the "point of the shoulder"); "D" Olecranon Process, (the "point of the elbow"). The space between B and C where the shoulder blade articulates with the upper arm is an easily felt notch on physical examination.

The shoulder blade (scapula) is the major point of attachment of the forequarters to the body (thorax) of the dog. The form of the shoulder blade never ceases to amaze me. The bone is flat on the back (dorsal) side (see Figure 4, B) and is fastened to the trunk via an attachment made of muscles, rather than a bony joint. This allows for the scapula to rotate with the movement of the upper arm (humerus) so that it can move smoothly across the rib cage. The raised bony "spine" (see Figures 4 and 5, A) protrudes upward from the front surface of the bone allowing for even more muscle attachment. This spine of the shoulder blade is one of the major "landmarks" for physical examination. The ligaments joining the bones are labeled "D" in Figure 4 and "B" in Figure 5.

Figure 6. Muscular Attachment of Front Assembly to Body

Figure 7. Fore Assembly Attachment

"THE ARTICULATION OF THE SHOULDER BLADE WITH THE UPPER ARM FORMS THE SHOULDER JOINT.

THIS 'SPHEROID' (BALL AND SOCKET) JOINT ALLOWS FOR A VERY WIDE RANGE OF MOTION SO THAT THE DOG CAN CHANGE DIRECTIONS QUICKLY AND EASILY."

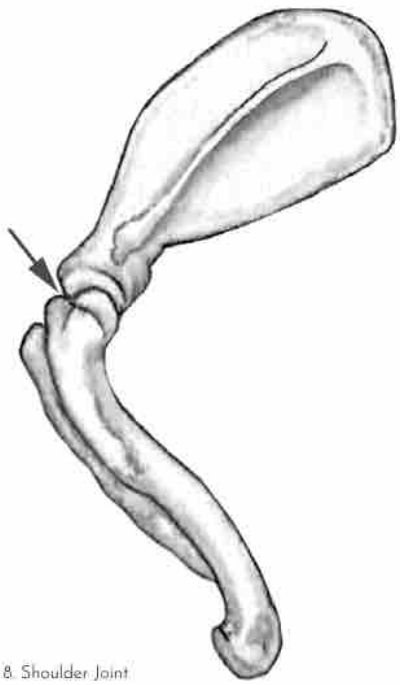

Figure 8. Shoulder Joint

The shoulder blade is attached to the neck (cervical vertebrae) and ribs (thorax) by muscles beneath the blade (dorsally) on the flat side of the shoulder blade—and above from the spine of the shoulder blade (see figure 6). Muscle "A" rotates the shoulder blade, "B" extends the forearm and "C" straightens the elbow.

This muscular attachment of the fore assembly to the body not only attaches the two areas one to the other, it also supports the weight of the trunk and its muscle groups, and serves to advance and retract the leg as well as move the neck. You need not learn all of the names and functions of each of the muscles in the canine body, but you do need to have an understanding that it is muscles that move the bones. The upper, larger edge of the shoulder blade is placed slightly below the spines of the spinal (vertebral) column (see Figure 7). The shoulder blade has no joint connection with the upper chest and spine, but lies between and is fused to flat muscle attached at the 3rd–9th vertebrae. Ideally, the highest part of the shoulder blade lies just below the level of the first through fourth vertebrae with the spine of the shoulder blade (scapula) pointing to the highest part of the blade.

In the majority of breeds, the upper arm is the largest bone in the fore assembly and, even though most breed standards call for an upper arm length as long as the shoulder blade, it is, for most breeds, actually longer than the shoulder blade. This is because the "point of the shoulder" usually referred to in measuring body length is actually the upper end of the upper arm (humerus) (see Figure 8).

The articulation of the shoulder blade with the upper arm forms the shoulder joint. This "spheroid" (ball and socket) joint allows for a very wide range of motion so that the dog can change directions quickly and easily. It is at this shoulder joint that the leverage is applied by the force of the muscles to change the position of the bones, allowing movement of the leg. The properly articulated bones of the shoulder and upper arm also serve to increase the area for the muscles to attach the entire front assembly to the trunk of the dog; and the more fit the muscles, the stronger and more flexible the dog is, which allows for more supple movement (see Figure 6).

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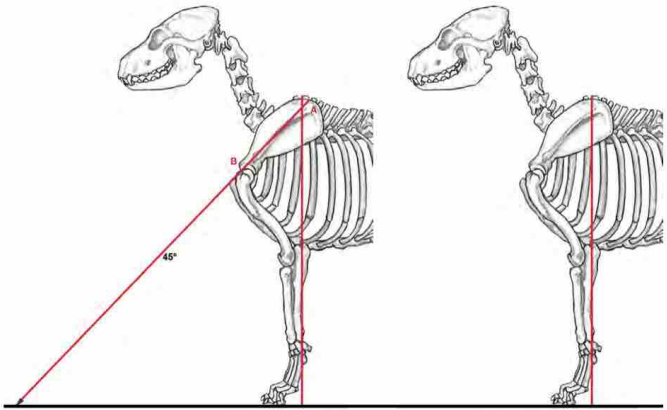
A CLOSER LOOK AT THE CANINE FRONT

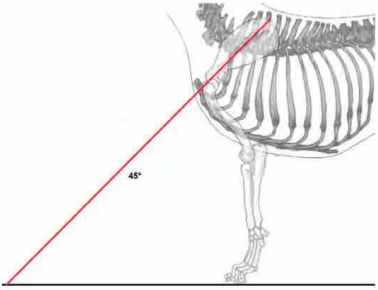
SHOULDER ASSEMBLY, PART 2

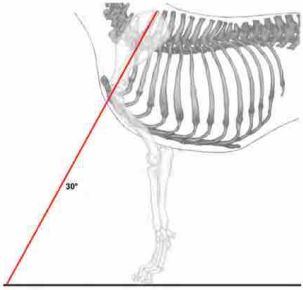
In the *average* dog, the shoulder blade (scapula) is described as "well laid back" at about a 45-degree angle to the ground, and is laid against the upper front section of the chest (thorax) (A) with the lower forward part of the scapula at about the first rib or frontal opening of the chest (B). (See Figure 1.)

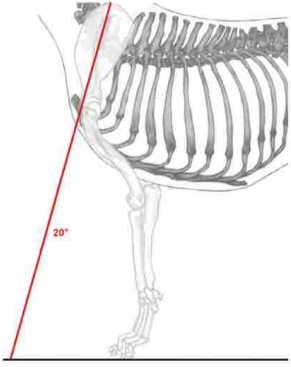
The 90-degree angle formed by the shoulder joint enables the dog to stand well over its forelimbs due to the return of an upper arm of the correct length to the elbow, which in the average dog is set in a line under the withers. (See Figure 2.)



pictured above, from left: **Figure 1**. 45° Shoulder Layback; **Figure 2**. Elbow Set in Line Under Withers







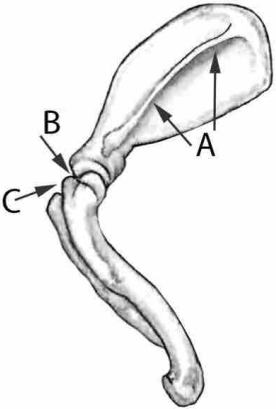
pictured clockwise from above left
Figure 3A. Well Laid Back Shoulder 45°
Figure 3B. Moderately Laid Back Shoulder 30°
Figure 3C. Upright Shoulder Blade 20°
Figure 4. Scapular Tuberosity A

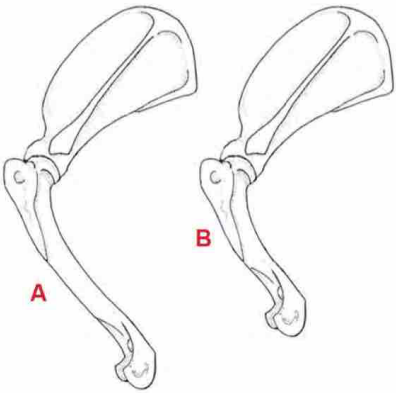
The layback of the shoulder blade determines the forward reach of the front leg. The junction of the shoulder blade to the upper arm at the ball and socket joint is referred to as the point of shoulder. This shallow cavity at the bottom of the shoulder blade forms a very shallow socket for articulation with the head of the upper arm (humerus). (See Figures 3A, 3B, 3C.)

It is important to note that the ball and socket joint formed where the shoulder blade (scapula) and the upper arm (humerus) meet is not a simple ball and socket type of joint, but is designed for a more sliding movement. This sliding action allows for freer movement in the front assembly and has far less force placed upon it than that produced by the hindquarters. This difference in action is what allows for more lateral movement of the front legs (paddling, winging, etc.) than can be found in the rear assembly. The corresponding ball and socket joint of the pelvis and the hind limb has a very deep cavity and an extremely stable joint that allows it to perform well, even with the stronger force placed upon it by the propulsion of the hindquarters. At the bottom end of the shoulder blade is a beak-like protrusion of bone—the "scapular tuberosity." (See Figure 4.) This tuberosity fits into a corresponding area on the head of the humerus and restricts the forward movement of the humerus and hence the forearm, thus limiting the reach of the forefoot, depending upon the layback of the shoulder blade as shown in Figures 3A-C.

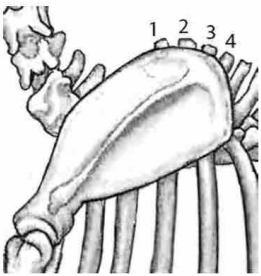
PHYSICAL EXAM OF THE FOREQUARTERS

It is extremely important to understand that although the rear assembly is attached via the articulation of the upper thigh (femur) at the hip (pelvis) and the pelvis is fused to the sacrum of the spine, the forelimbs of the dog have no skeletal attachment to the chest (thorax), only a muscular attachment. The shoulder blade is bound to the body by several broad, flat muscles. At the lower end of the shoulder blade is the upper arm (humerus), which is fairly free in movement, though it is attached to the chest (thorax) by several muscles. The layback of the shoulder blade determines the front reach of the dog. The angulation can be determined when physically examining a dog and depends on certain "landmarks" or points where the bones may be felt through the coat, skin, muscles, and fat of the dog being examined.





pictured above, from left:
Figure 5. Spine of Scapula and Notch
Figure 6. Angle of Shoulder Blade to Upper Arm (A Normal Dog, B Dwarf Dog)



pictured left:
Figure 7. Position of Shoulder Blade on Vertebrae

On the shoulder assembly, the easily felt landmarks are the spine of the scapula (A) and the "notch" formed where the shoulder blade meets the upper arm (B). The point of shoulder is actually the top of the upper arm (C). (See Figure 5.)

The upper arm is approximately equal or somewhat longer in nearly all but the dwarf breeds. The body of the upper arm (humerus) makes approximately a 90-degree angle with the spine of the scapula as it returns back to articulate with the leg bones at the point of the elbow. From the point of shoulder, the angle between the blade and the upper arm is perceived to be approximately 90-degrees. By perceived, I mean that using the landmarks available to us when physically examining a dog, the optimum layback of the shoulder blade for most breeds is a 45-degree angle to the ground. To place the leg up under the body, then a 90-degree angle formed by the juncture of an upper arm of the correct length to the shoulder blade would place the leg back under the body with the elbow approximately beneath the highest point of a well laid back shoulder blade. (See Figures 2 & 6.)

Ideally, the highest part of the shoulder blade lies just below the level of the first and fourth vertebrae, with the spine of the shoulder blade pointing to the highest part of the blade.

In the majority of breeds, the upper arm is the largest bone in the fore assembly and, even though most standards call for an upper arm length as long as the shoulder blade, it is, for most breeds, actually longer than the shoulder blade. Again, the point of the shoulder usually referred to in measuring body length is actually the upper end of the upper arm. (See Figure 6.)

To help put all of this together in a manner much more straightforward than I am able to do in a few pages, I would encourage you to purchase *The Dog Anatomy Workbook*, edited by Andrew Gardiner and illustrated by Maggie Raynor. This is a sophisticated "coloring book" that has to do with canine anatomy. I found the illustrations on pages 54 & 55 and the explanations of the forelimb muscle functions on pages 70 & 71 to be quite enlightening. I especially like the "muscle lines" diagram of the forelimb muscles on pages 80 & 81. If you are like me, your eyes start to glaze over when trying to study the muscles of the canine body. As an artist, I am very visual and I've found this book to be an excellent source of information.