JOINTS & LOCOMOTION OF THE FOREQUARTERS

By Wendell Sammet and Lisa Dubé Forman

Simply put, Wendell Sammet has been active in Poodles longer than anyone else involved today. He started with Poodles in the early 1950s handling some of the famous Hollycourt Miniatures and soon after was chosen by Mr. & Mrs. Henry J. Kaiser to oversee the breeding program and handle their Alekai Standard Poodles. After a 40-year partnership Mrs. Kaiser bequeathed the kennel name to Wendell (it was changed slightly to Ale Kai to separate the two eras). In total Alekai/Ale Kai has won the Non-Sporting Group at Westminster Kennel Club four times, Best-of-Variety Standard at the PCA National Specialty an astounding seven times, and has produced countless champions and top producers. Ale Kai bloodlines stream through most Standard Poodle families today.

Wendell has personally been honored with the following: 1997 Gaines Dog Handler of the Year award; 2002 AKC Breeder of the Year; 2004 Dogs in Review annual Winkie Award for Best Breeder-Owner-Handler; and in 2007 inducted into the Anne Rogers Clark Hall of Fame sponsored by Purina Pro Plan/Show Dogs of the Year Awards.

Lisa Dubé Forman is an Irish Wolfhound breeder for 33 years, an AKC Judge since 2007, and an overall fancier of purebred dogs, with a special emphasis on breed origins, form and functions. Having previously written for the Canine Chronicle *magazine as well its digital edition for approximately six years, she has authored numerous articles on canine anatomy as well as expositions on the purebred dog industry's current affairs, along with human-interest stories, a number of which have been reprinted in breed club educational programs and various foreign dog publications. She continues as a freelance writer and as a blogger at DogBlogMusings.com. This is her second contribution to* Poodle Variety *working with her friend and mentor, Mr. Wendell Sammet.*

Movement is wholly dependent on joints and, but for a few deviations from the norm, we endeavor to design an easy gait in nearly all breeds. To do so, one must grasp the importance of joints and their relationship with motility.

We begin with the forequarters, which are fundamentally a ball-and-socket mechanism with hinge joints. The functional anatomy of the forequarters, as well as its connecting parts, should be elementary to all fanciers as its natural purpose is to anchor not just the forelimbs but the entire canine structure.

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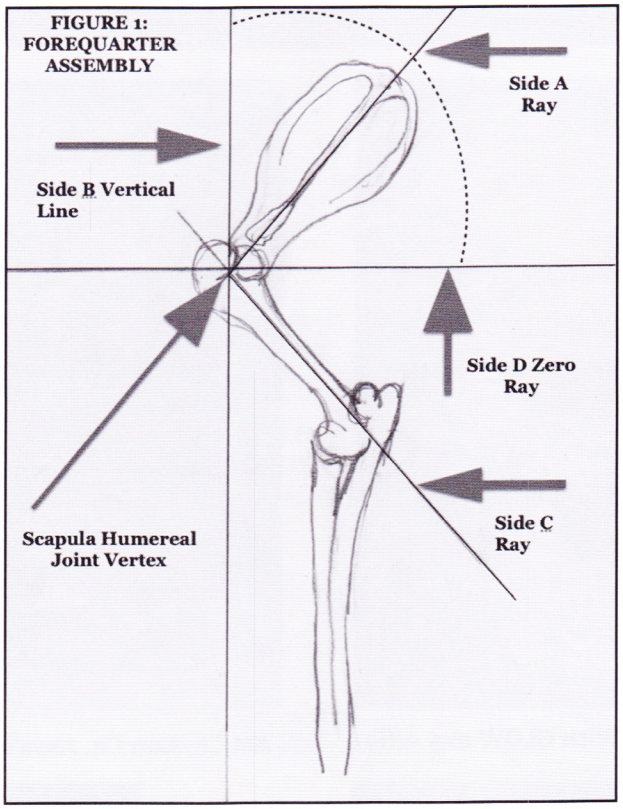
The forequarter assembly consists of the shoulder **(scapula)**, the upper arm **(humerus)**, the forearm **(radius and ulna)**, the wrist **(carpal)**, the pastern **(metacarpal)** and the feet **(phalanges)**. All of these bones should be ideally engineered to place the forelimbs in such a position that the elbow resides at the lower level of the chest or rib cage **(breastbone** or **sternum)**. As a result, if one were to draw an imaginary straight line, or interchangeably, drop a plumb line from the highest point of the shoulder downwards through the point of the elbow; it would intersect with the back of the pad on the front foot.

One cannot underestimate the value of an excellently constructed forequarter as the forelimbs behave as columns supporting at least 60% of the dog's body weight. Because the rear assembly propels the front end, the forequarters must be built flawlessly for complete absorption of the impact both from the momentum of gait as well as jumping. The forequarters also stabilize the body while turning and maintain the center of gravity or balance point, which is believed to be the area where the entire weight of the dogs' body is concentrated, located behind the elbow, approximately one-third up from the sternum. If supported at this center or balance point the body will remain in equilibrium in any position.

If one desires to improve upon gait, one must understand the fundamentals of the working shoulder and its joints. The shoulder blades lay the groundwork for a useful, optimal forequarter assembly. They are the only bones of the dog's body that are not a ball-and-socket or a hinged joint. These blades are broad, slightly triangular and their length should be approximately equal in length to that of the upper arm. The outer surface of the shoulder blade has a bony projection that starts out modestly and ends prominently. It is commonly known as the **ridge** or **scapula spine** running from top to bottom, dividing the bone

into almost equal sides. The spiny ridge ends at the lowest end of the scapula in a familiar protuberance all fanciers have palpated known as the **acromion process**. The shoulder blades lie alongside the rib cage **(thorax)** and are secured to the spinal column by strong bands of muscle. Students should realize that the shoulders oscillate or swing during the locomotion phase due to the intrinsic muscles that are attached on both sides of the scapula spine which flex, extend and stabilize the shoulder. The undersides of the scapula blades are smooth so that they slip fluidly over the first five ribs while swinging approximately 15-degrees forward and backward.

While examining a dog that is not heavily muscled, one can feel the spine or ridge as it traverses rearward in a slanted direction. It is the positioning of these scapula blades that represents the popular phrase "**layback of the shoulder**." Their arrangement and the subsequent tilted orientation of the scapula ridge creates a joint angle which is key in two common, pivotal forequarter measurements estimated by both eye and hand.



How To Correctly Measure Joint Forequarter Angulation

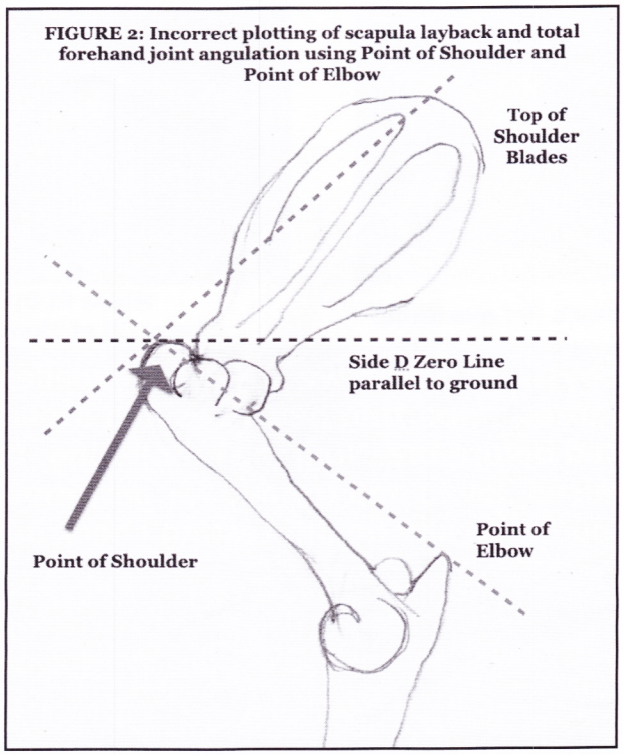
First, let us address a popular myth. The concept of a perfect 90-degree forequarter constructed with a 45-degree layback of a shoulder is neither feasible nor achievable. This belief has been refuted by scientific studies with moving x-rays, precise illustrations, post-mortem dissections, and by many of the top canine sports authorities in the world. Conversely, by no means do the scientific findings of notable dog authorities advocate upright or straight forequarter assemblies. In fact, poorly constructed front ends are still one of the most widely observed faults in purebred dogs today. In this article, we will talk about the merits of a proper forequarter assembly, and reflect on the functionalism and practicality of its design. However, fanciers must first learn how to measure joint forequarter angulation correctly.

Typically, there are two methods to determine the forequarter joint angles. The first conventional method plots Side A of the angle's ray which runs along the shoulder spine. Side A's ray intersects at the vertex with Side D or Zero line which is fixed parallel to the ground traversing the **scapulohumeral joint** (where the scapula meets the humerus of the foreleg). Alternatively, the second commonly seen measurement of the shoulder layback is charted vertically with Side A's ray drawn along the shoulder spine intersecting at the vertex but this time with Side B's ray which in this case is perpendicular or upright. This opening is plotted vertically instead of horizontally. *See Figure One.* Whichever method, generally speaking, the best possible shoulder should create an angle of 50-55 degrees rearwards or 35-40 degrees from the vertical.

In contrast, figure 2 illustrates the widely used but incorrect method for determining shoulder layback. The inaccurate technique estimates, whether by hand or eye, a line from the highest point or top of the shoulder blades down through the scapula blade and ending at the point of shoulder (the bony protrusion in front of the humerus which we explain in detail further on).

Next is the conventional measurement of the assembled shoulder and humerus joint orientation which amounts to the total angulation of the forehand. The interconnection of the upper arm with the scapula and mainly, the incline of and length of the humerus has a direct influence on a dog's greater energy efficiency. If correctly engineered, the forehand will have a relative angle of approximately 100-105 degrees, not 90-degrees.

Here again, we offer guidance on how to accurately calculate this area. The proper computation of this angle is the result of two lines intersecting at the scapulohumeral joint and elbow joint. We begin with the first of these two lines being Side A's ray running downwards along the shoulder spine, bisecting with Side C's ray which runs through the center, or shaft, of the humerus and the elbow joint. The most frequent ***but*** incorrect method of estimating



the formation of the forehand has the imaginary lines drawn from the scapula ridge through the point of the shoulder meeting with a line drawn from the point of the elbow (the bony protrusion above the elbow joint discussed further down) up through the humerus. *See Figure 2.*

There is Substantial Significance to a Sloping Shoulder

The more inclined the scapulae are, the longer and broader the bones will be, thus the greater the area for muscle attachment. Moreover, the longer, sloping scapula bone also allows for greater forward reach during gaiting. Students should understand the fundamental principle that a dog cannot step beyond the angle joint of his shoulder, which determines when the joint mechanisms lock in place.

The primary function of a well-constructed shoulder blade is to oscillate back and forth mobilizing, the forelimb. The reach of the front leg and its lift is obtained when the leg is entirely straight. The essential muscles attached to the scapula blades rotate the blades an average of 15-degrees forward and 15-degrees backward from the stationary position. This swinging to and fro of the blades aid in propulsion and thrust by lifting the foot off the ground during the forward reach of the leg. Lastly, a sturdy, faultless layback of shoulder allows for greater extension in which the fully extended foot's large metacarpal footpad hits the ground first, absorbing the shock of impact. *See Figure 3.*

On the contrary, we hear the term "upright shoulder," which describes shoulder blades having an inadequate rearward slope, as they sit nearly upright instead of tilting backward. In effect, Side A's ray of the measured angle creates a broader space between Side D's zero line, such as 60-65 degrees, instead of the desired 50-55 degrees. This greater open angle affects efficient travel. During the forward stride phase, a steep 65-degree shoulder assembly provides a vertical thrust of power instead of fluid, forward momentum. This up-and-down shoulder motion resembles a rocking horse traveling upwards and downwards. The movement is operational but lacks sufficient progress. In contrast, a 50-55 degree shoulder possesses forward momentum because the more significant shoulder layback permits the extended reach of the forelimb. The disparity between the two directly relates, again, to the doctrine that a dog cannot step beyond the angle of his shoulder.

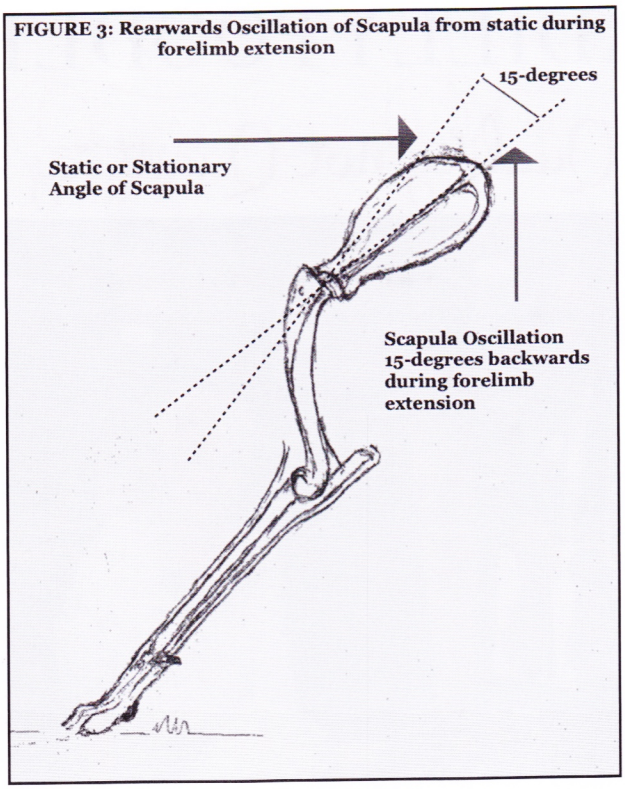


FIGURE 3: Rearwards Oscillation of Scapula from static during forelimb extension

Joint Assembly

Many of the joints located in the forequarters are already familiar to some fanciers as they have learned about them the hard way. When an injury or hereditary faulty construction occurs within these joints, the result is lameness and significant discomfort that may require surgical intervention to remediate the dog's pain. As a result, sound joint articulation is of the most vital importance, and it is equally important to identify what they are and know how they work.

The scapula blade connection with the humerus is a ball and socket joint. On the underside of the scapula blade is the concave **glenoid cavity** which is a shallow, oval pocket, that articulates with the convex head of the humerus. This compartment allows for gliding movement with minimal force. Of course, you do not have to try and remember the cavity's name but know that this area of articulation can be prone to dysplasia, called **scapulohumeral** or **glenoid cavity dysplasia**, in which small and Toy breed fanciers are very familiar with the disease.

On the scapula, in the front of the **glenoid cavity** is a peculiar, beak-shaped bone known as the **supraglenoid tubercle** (supra being the prefix for above). Its purpose is to control the forward movement of the humerus, subsequently affecting the extension of the foreleg. *See Figure 4.*

How this works is that the oscillating scapula rotates approximately 15 degrees rearwards as the upper arm swings forward. The range of this forward swing is determined by how soon the tubercle beak-shaped bone engages with the head of the humerus. To illustrate, if the scapula is adequately inclined, such as 50-degrees, the supraglenoid

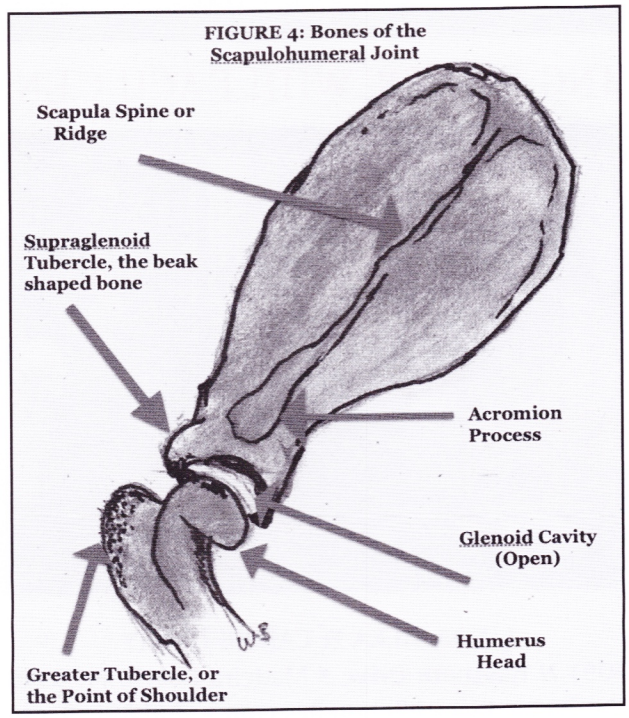


FIGURE 4: Bones of the Scapulohumeral Joint

tubercle engages with and locks the upper arm further out from the body. In comparison, on the upright roughly 65-degree shoulder, this beak-shaped bone will join with and lock the upper arm much sooner, resulting in limited reach or extension from the static or standing position.

The humerus, **(brachium arm)** or upper arm, is a long, in some measure, S-shaped bone surrounded by large muscles extending downwards to the area of the elbow joint. At the attachment to the scapula, there is a large bony protuberance that most fanciers are already acquainted with but are unaware of its name. Technically it is called the **greater tubercle**, but we refer to it as the **point of the shoulder** as it is easily felt during examination and is one of the most familiar landmarks of the forehand. At the bottom end of the upper arm are two easily palpated bones protruding from the inside and outside of the bone just in front of the humerus's intersection with the foreleg. These are called **humeral epicondyles,** and behind them is a rectangularly shaped protuberance which all fanciers are familiar with palpating, technically called the **olecranon process** or **tuberosity**, but widely known as the **point of elbow**.

This projection serves as a lever, because here the **triceps brachii** muscles are attached which draw the elbow into extension. The elbow is marvelously multifaceted, being that it is a **pivot joint** where the combined radius and ulna meet, and it is a **hinge joint** for the connection between the humerus and the merged radius and ulna bones. A vital area of the elbow joint is the **anconeal process** located where the ulna meets with the humerus forming the rear portion of the elbow joint. Here, nestled between the two, is a growth plate. The anconeal process can be susceptible to developmental problems and growth disturbances called **elbow dysplasia**. A defect readily understood by many dog breeders, it is caused by genetics, cartilage growth, diet as well as exercise. Several forms of elbow dysplasia are **FCP (fragmented coronoid process), UAP (ununited anconeal process)** and **OCD (osteochondritis dissecans)**. *See Figure 5.*

We have reached the forearm **(antebrachium)** with the **radius** bone located on the frontal area of the leg and the **ulna** bone situated in the rear. It is also noteworthy that the radius is the central weight-bearing portion of the forequarters, and that the Ulna, the longest bone in the body, is responsible for stabilizing the elbow joint. At the lower, or distal, end of the forearm, we find the wrist or the carpus joint. *See Figure 6.*

The carpus is composed of three articulations with the most notable being the **antebrachiocarpal joint** which is adapted and best suited for running, providing an incredible 70% range of motion. The carpus is made up of seven bones of which we will not individually define, but we will point out one or more essential details related to this discussion. One particular bony protrusion that nearly all fanciers have felt but are unfamiliar with its technical name is the **accessory carpal**.

Located at the lower end of the ulna is the **accessory carpal** bone, which projects off the rear of the dog's wrist. It forms a joint with the **ulnar carpal bone** and the **flexor carpi ulnaris muscle,** whose tension or resistance, when acting on the accessory carpal bone, retains the posture of the carpal or wrist

FIGURE 5: Elbow Joint and Antebrachium or Forearm

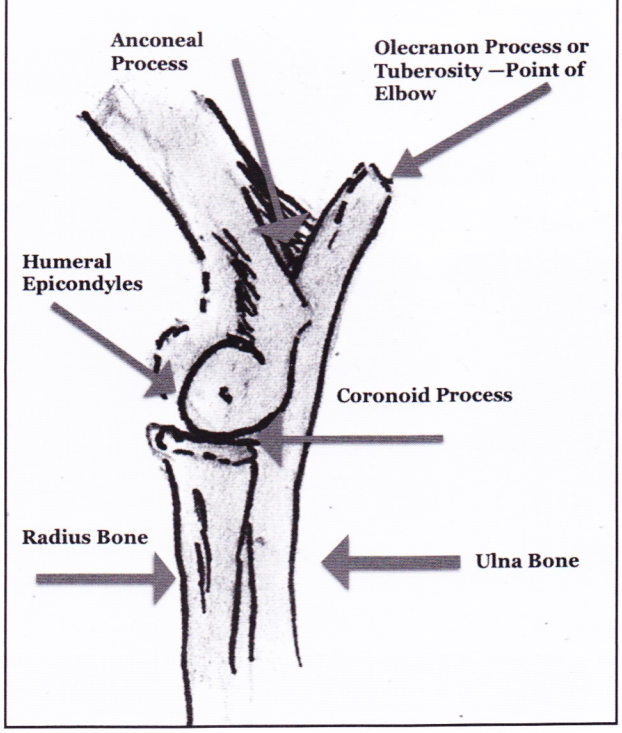
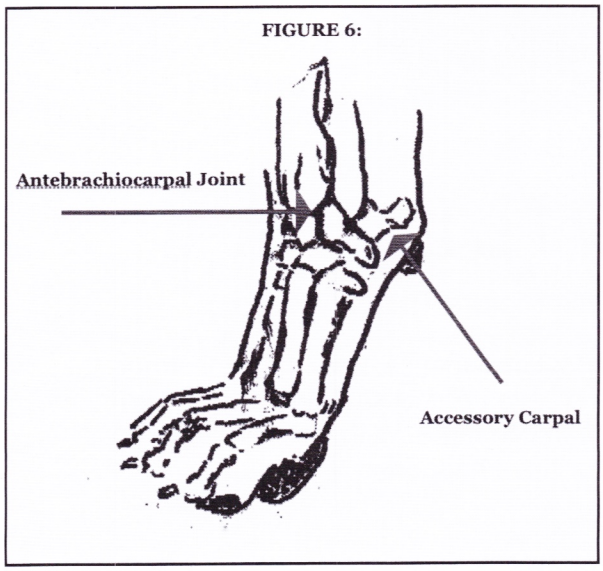


FIGURE 6:



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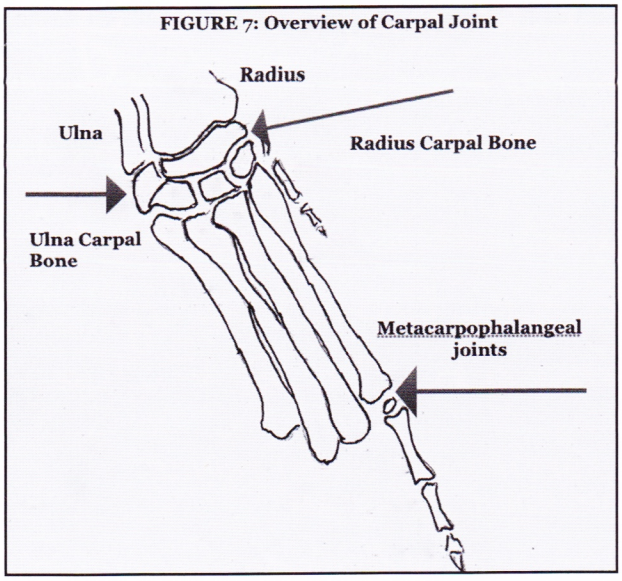

and withstands any buckling forward, instability or collapsing. An interesting piece of trivia is that as the carpus or wrist bends, a dimple appears on the skin over the antebrachiocarpal joint, which many fanciers may have noticed. Lastly, the metacarpal area contains five palpable bones connected to the four **metacarpophalangeal joints,** which are responsible for flexion and extension.

These, in turn, each have a pair of Sesamoid bones that articulate with the weight-bearing phalanges or toes. Most interestingly, a dog's posture or carriage is called a **digitigrade stance** because he stands on and walks on the II through IV toes, in contrast to other animals such as bears or gorillas who walk on the soles or undersides of their feet. *See Figure 7.*

Many agility event competitors and trainers most likely are familiar with the carpal joint area, as it is prone to hyperextension injury called **carpal breakdown**. Commonly seen in agility dogs, carpal breakdowns are mostly due to tearing of the carpal ligaments and fibrocartilage from excessive force of constant jumping and rapid turning, leading to a collapse of the joint.

There is so much more that needs to be defined, but this introductory lesson on the dog's major joints of the thoracic limbs will have to suffice for now as we move next, in an upcoming article, to the hindquarters.

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AUSTRALIAN NATIONAL

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High In Trial winner was TCh. Ro. Ch. Giday Quicksilver Daisy CDX TDX RAE ET

However, she is a very striking showgirl and is presented and handled to let her shine. Best Junior Of Breed & Best Junior In Show."

I want to add that James was in a lot of pain from an operation for a burst appendix. He had convinced the doctors that he would only get his dogs ready and have someone else show them. He did a brilliant job with great effort to get them ready and handle them himself.

An Obedience Trial was also held with an entry of 12 Poodles. High In Trial winner was TCh. Ro. Ch. Giday Quicksilver Daisy CDX TDX RAE ET with a score of 196 out of 200.

The trophies for this Natonal had wonderful sponsorship from Royal Canin, Liberty International, Plush Puppy, Dog News Aust, Clipperman P/L and Easy Dog Entries. Financial donations from Poodle exhibitors enabled glass cheese boards on mounts for each class in show, and canvas prints by Iain Hinde with a logo he designed for this show.

The full-size catalogue was very well designed featuring all colored advertisments. It was greatly supported by breeders and owners advertising. A great souvenir and future reference.

I thoroughly enjoyed watching this show. It is always interesting to see how a specialist from the United Kingdom handles the Poodles entered and to garner what they are actually looking for. I also had the pleasure of sitting with Ray Udy from New Zealand. There was a contingent of 10 visitors from New Zealand including the president, vice president, secretary/treasurer and two committee members of the Dominion Poodle Club over in Melbourne enjoying our Poodle National. There was also a Miniature Poodle exhibitor, Emma Case-Peters.

Ray Udy, who is the Secretary/Treasurer of the club, said "We were all most impressed with the Committee's help and assistance with keeping intending visitors in the loop, with ordering catalogues, merchandise, after show buffet tickets, etc. We were all made to feel very welcome. Special thanks to Jo Turnley and Helen Turner who ran this great National Show."

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Nola Westren has owned, bred and exhibited Poodles since the mid 1960s. She commenced with Miniatures but now concentrates on Toys. Nola also bred a Standard bitch which she titled and who produced a very successful litter. Nola's Toys have been handled by friends following an accident which prevents her handling. She has dabbled in all colours in her Toys but concentrates on reds and blacks. She has bred two Grand Champions and one Supreme Champion under the "Alamoana" prefix and has put over 100 titles on dogs she has bred or imported. She lives in Sydney, Australia and has wrote for Poodle Review *from 1994 until it was taken over by* Poodle Variety *in 2012. Nola can be contacted at alamoana1@optusnet.com.au*