

FLY CASTING:

Substance & Style

BY AL KYTE AND GARY MORAN

Al Kyle is a professor at the University of California at Berkeley. He has taught fly fishing and casting for 30 years. Gary Moran has a PhD in anatomy and kinesiology, and is a research, medical, and forensic biomechanist.

In 1993, we studied the biomechanics of fly casting and discovered the common characteristics of the most successful distance casters. We decided to call these common elements the substance of a fly cast. But we also noted that, even though all the casters shared these common elements, there were many differences in their casting motions. These differences between such casters can be defined as individual style. Little, if anything, has been written that compares these different styles of fly casting. Yet anyone learning to cast can benefit from knowing not only the important substance of the cast but also something of the different ways to accomplish it. We did some additional filming and analysis of expert casters, which resulted in the information presented here.

What Is Good Form?

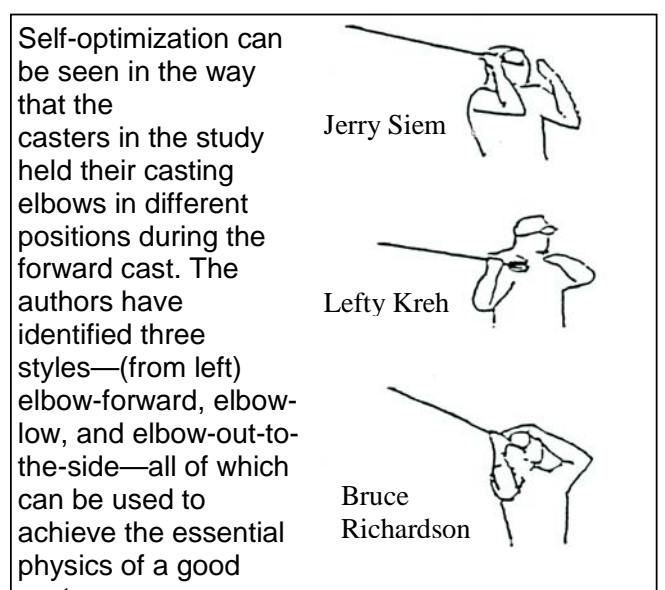
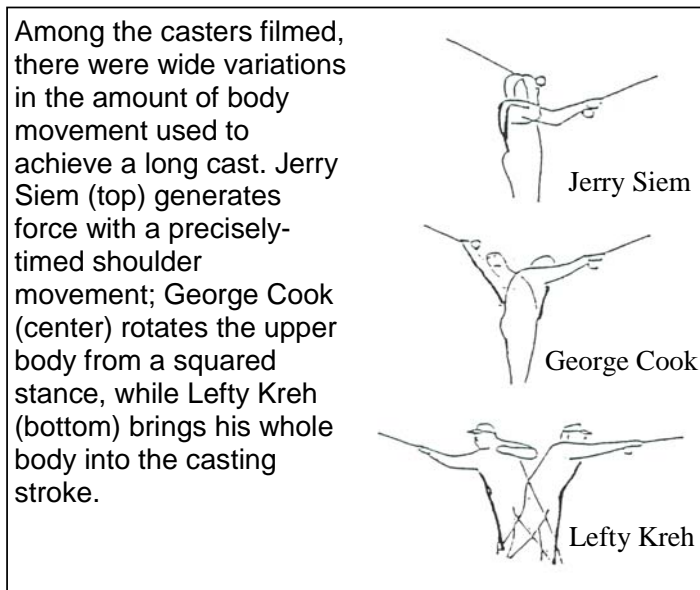
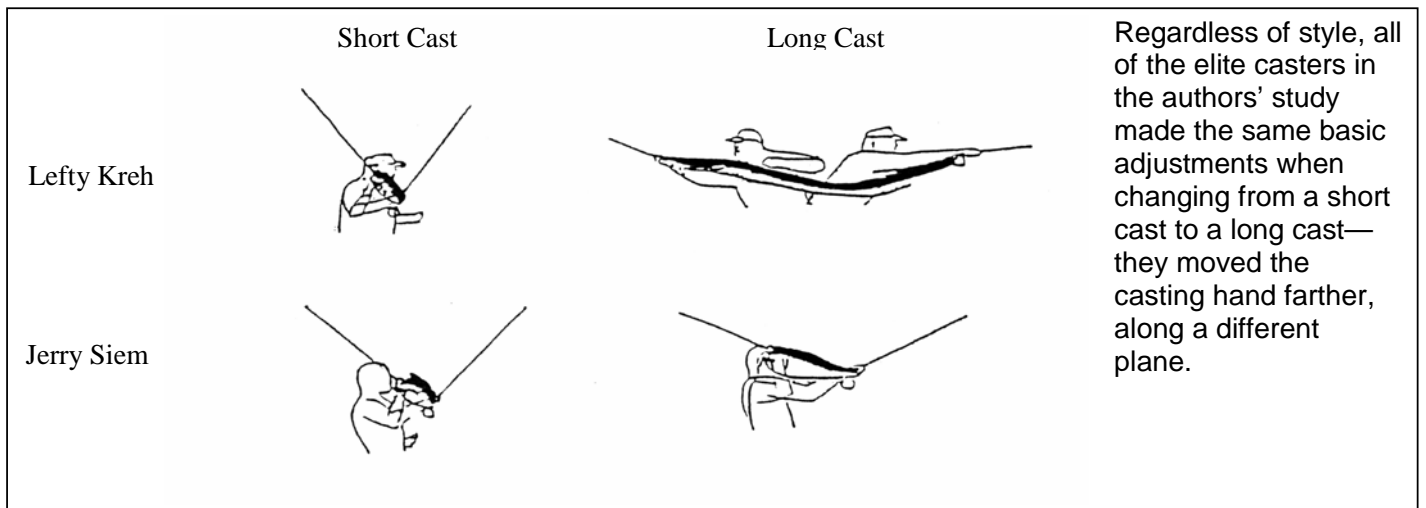
Most beginning fly casters try to copy the form of Lefty Kreh, Mel Krieger, Steve Rajeff, Joan Wulff, or some other world-class caster. Yet, these experts have very different casting motions. This can be confusing to casting instructors, as well as to students. We use the science of biomechanics to put such differences in perspective by breaking down the cast into four elements: the “essential physics” of casting, the purpose of the cast, the caster’s individualized movement tendencies, and the casting equipment. Each of these elements may affect a caster’s movements and, to some extent, helps define good form.

The first thing we wanted to do was to define the “essential physics” of a cast, those movements that transcend the differences that we observed among skilled casters. The most essential physics of an overhead cast may be described in three sequential *straight-line* movements that occur before, during, and after a cast. First, the caster starts a forward casting stroke when the fly line is straightening directly back from his intended target direction. Next, he smoothly accelerates the rod tip and fly line forward along this target direction. Finally, he stops the rod so that the line rolls out over itself along this same path in as narrow a loop as possible, until it straightens again.

The key to GOOD CASTING isn’t style; it’s an understanding of the ESSENTIAL PHYSICS involved.

In our study, the “elite” casters— those who made the longest casts—differentiated themselves from the less-successful “good” casters by straightening the line more completely on the back cast (with less line “sag”), accelerating the rod tip along a straighter path, and stopping the rod more abruptly — causing its tip to unload closer to the moving fly line, thus forming tighter loops. It’s clear that the same physics that we teach to our beginning students continues to define proficiency when experienced casters attempt longer, more difficult casts.

If these three straight-line movements occur as described, then the caster has also accomplished some other important things. He’s loaded and unloaded the rod properly, adjusted the rod angles and stroke length effectively, and achieved correct timing between casts. Thus these dimensions—rod bend, rod angle, stroke length, and timing—are variables that casters adjust in order to achieve something more important: the straight-line movement of the fly line. It is these variables that help to define different casting “styles.”



As our study shifted from the basic physics of a fly cast to other dimensions, we noticed differences in the way casters move. Some differences can be understood without looking any further than the purpose of the cast. When casters change the primary purpose of the cast, they begin to rely on different biomechanics principles or methods. When casters focus on accuracy, they shorten the casting motion, use fewer body movements, and slow the muscular action. On the other hand, casters who are trying to generate line speed for maximum distance lengthen the casting motion, use additional body movements, and speed up the muscular contraction. Thus, factors that contribute to accuracy may decrease velocity, and vice versa. So for any cast, you should determine the most suitable line speed and adjust the movement accordingly.

The effects of changing purposes are most clearly seen when casters change from short to long casts. This became apparent in a follow-up study we performed in January 1997, in which we filmed seven outstanding casters, including Lefty Kreh, Jerry Siem, Bruce Richards, and George Cook. We were primarily interested in identifying similarities and differences in world-class casters when they performed the same sequence of casts with identical fly rods and lines. Although we compared such things as rod actions and types of fly lines, the most impressive differences appeared when contrasting a 35-foot cast for accuracy to a cast of approximately 90 feet.

When comparing these casts, we first noted striking differences in the amount of rod bend and rod angle, two variables that interact closely. In long casts, the extra line weight being cast and the force applied by the caster put additional bend in the rod, which lowers its tip. The demand for a straight tip path means that the lowered tip also needs to be lowered at the start and end of the casting stroke. Casters accomplished this by widening the angle through which the rod moves during the cast, sometimes called the casting “arc.”

The seven expert casters rotated the rod butt forward an average of 78 degrees during the shorter, 35-foot cast and a much wider angle of 133 degrees during the long cast. *Every caster, regardless of style, widened the rod angle considerably when casting for distance.* This comparison of short to long casts also allowed us to study differences in stroke length—the distance the hand moves the rod butt toward the target during the cast. We found that all seven experts, when changing from short to long casts, changed both the direction and distance that the casting hand moved. The hand movements during the forward stroke of the 35-foot cast were short and more downward than forward. During the long cast, the hand movements were substantially longer and directed more forward than downward. This difference between the stroke length of short and long casts supports the teaching concept of “shot cast, short stroke; long cast, long stroke.”

But despite the fact that the most impressive distance casters in our studies were characterized by wider rod angles, increased rod bend, and longer hand movements, such departures allow the caster to achieve the same straight-line physics that we expect with the shorter, basic cast. The purpose and movements may change, but the “essential physics” do not.

Self-Optimizing

Casters do move differently from one another, even when the casting purpose is identical. Although an instructor may require exact movements, students soon begin to differ in such things as length of casting strokes, hand position, and degree of wrist firmness. We refer to this phenomenon as people’s tendency to “self-optimize” or unconsciously select movements that seem to work best for them.

This tendency to self-optimize grows out of differences in anatomy, physiology, size and strength. For example, a tall person may cast farther than a shorter person, owing to the greater tip velocity that results from moving a longer lever system (the arm and the fly rod) at the same speed. A shorter person may cast longer by possessing the strength or arm speed to move his or her lever system faster than the taller person. People begin to rely on slightly different movement patterns to gain an advantage, often without realizing how this advantage is achieved.

We see self-optimizing in the way a distance caster uses his body to provide additional force to the casting arm. Lefty Kreh’s “open stance” uses the entire body to apply force. George Cook achieves a long forward movement

primarily by rotating his upper body from a squared stance. Jerry Siem applies force explosively with a more limited but precisely timed shoulder movement.

We also see self-optimizing in the casting arm. Most noticeably, casters position the elbow differently for a forward cast. Jerry Siem exemplifies the “backward elbow” style. This style frequently develops in tournament casters who keep both the forearm and fly rod vertical to help achieve extreme accuracy. Lefty Kreh’s arm is closer to a “low elbow” style. Lowering the elbow provides a strong hand position close to the body to assist in applying force to heavy or stiff rods, which makes it well-suited to the demands of saltwater fly fishing. Bruce Richards exemplifies the “elbow out to the side” style, which is often seen among float tubers and deep waders who need to keep the casting elbow out of the water. The elbow remains out to the side as a stationary pivot point, while the shoulder is used to rotate the hand forward. Although their styles vary and utilize muscles differently, these casters all start applying force to the rod before the casting hand moves forward of the body. And each of them accelerates the fly line along an unusually straight path.

A student of casting can benefit from this knowledge that experts move differently. You don’t have to be an exact replica of your instructor. The important test is in the straight-line physics of line movement, including loop control.

Making It Work for You

Whether you are learning a basic cast or fine-tuning to add distance or increase accuracy, the concepts presented here can help guide your practice. Keep your primary focus on the most basic substance of the cast — moving the fly line along as straight a path as possible. You can tinker with the other dimensions of the cast — rod angles, stroke length, loading and unloading, timing, grip, and stance — to find the combination that gives you the straightest movement and tightest loops. This combination of adjustments defines your style.

Start by checking the path of the fly line during the cast by bringing the rod tip down parallel to the ground. This sidearm cast allows you to watch the line straightening behind the rod tip, the tip moving along a straight path, and the loop being formed as the rod is abruptly stopped. There’s no better way to obtain a visual picture of the most important straight-line concepts of the cast. You can also find a large mirror or reflective window for viewing the path of the fly line.

Experiment by intentionally varying rod angles, the amount of force, stopping points, grips and movements, and note differences in the rod tip’s path and the loop it creates. Typically, people find they need smaller loops, and they learn to limit the angle the rod butt moves and to stop the rod more abruptly.

If you have been casting side-arm and have gained control over the path of your fly line, gradually return your casts to an upright angle. Then experiment with longer casts. If tailing hoops suddenly appear, try a longer hand movement or a wider rod angle. If your loops open too much, you have probably overdone one of these adjustments.

Sometimes fly casting is presented as a precise sequence of movements, and any deviation is treated as an error. This tendency to teach style as if it were substance often leads to confusion about casting form. Don’t be intimidated by some of the great casters you see at outdoor shows. As long as your fly line moves in a straight path, there is no reason to feel self-conscious about your style.