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The Geometry Of Golf

Why The Ball Curves

The geometry of golf will be a series of articles that will appear in each of this year's issues of Tee Times Magazine. Each article will focus on the science of the game of golf. In this series we will address some of the myths and misconceptions regarding the golf swing and why the golf ball does what it does. We hope that, through this series of articles the reader gains a better understanding of the golf swing and has more success when they play, practice or take a lesson. By applying science to the swing, we can eliminate guesswork. This minimizes confusion and speeds improvement.

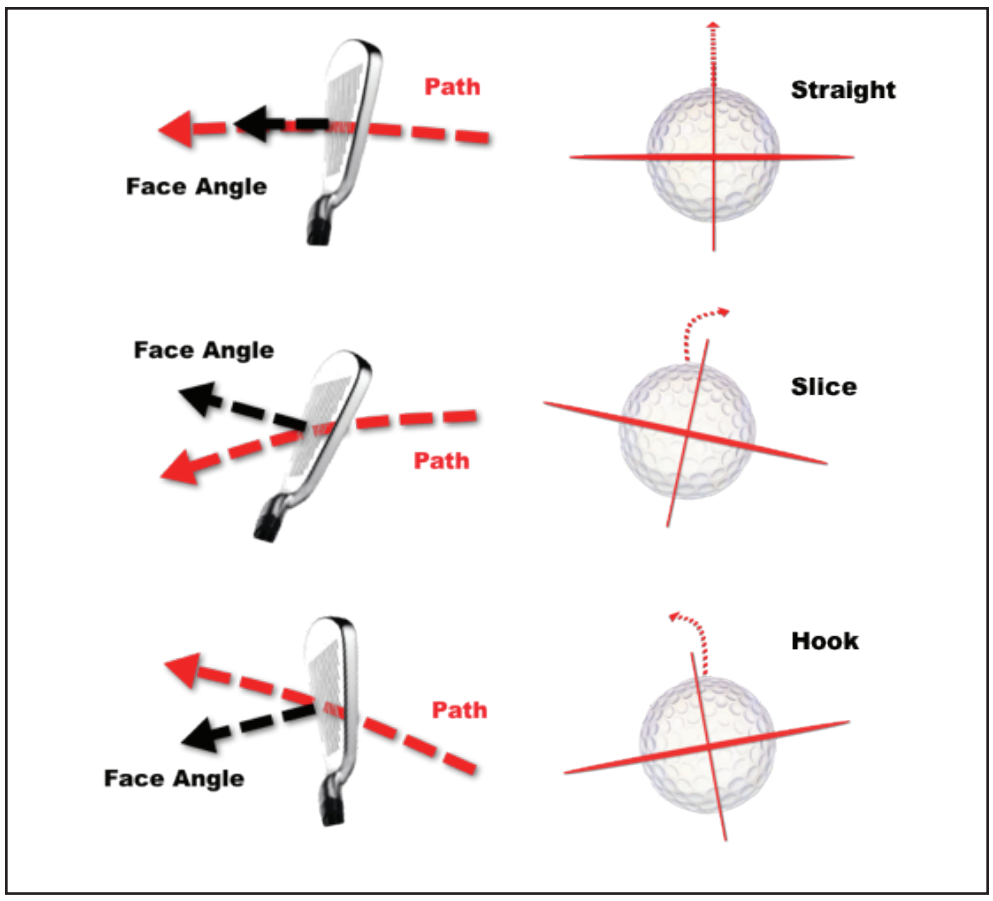
Curvature
In this first article we will discuss why the ball curves.

The vast majority of shots we hit in golf have some degree of curve to them. What happens to the ball at impact that makes the ball curve? Curvature is a caused by the direction that the golf ball is spinning.

A commonly held misconception is that there are two types of spin; backspin and sidespin. It is generally believed that these two spins work together to create the curve of the ball. In reality, the ball spins on an axis, and the direction that the axis is tilted is the direction that the ball curves. Spin axis is similar to the way an airplane flies. When the wings are level with the horizon the plane flies straight. When the wings tilt to the right the plane banks and turns to the right. When the wings are tilted to the left, the plane banks and turns to the left.

The ball's spin axis becomes tilted when there is a difference at impact between the face angle and the path of the club. The larger the difference the more tilt and subsequently more curvature.

When, the golf ball is hit in the **center of the clubface**, the ball starts in the direction of the clubface at impact. If there is a difference between the direction of club path and the face angel the spin axis of the ball will tilt. For example, if the clubface is open relative to the path the spin axis will tilt to the right and cause the ball to curve right.



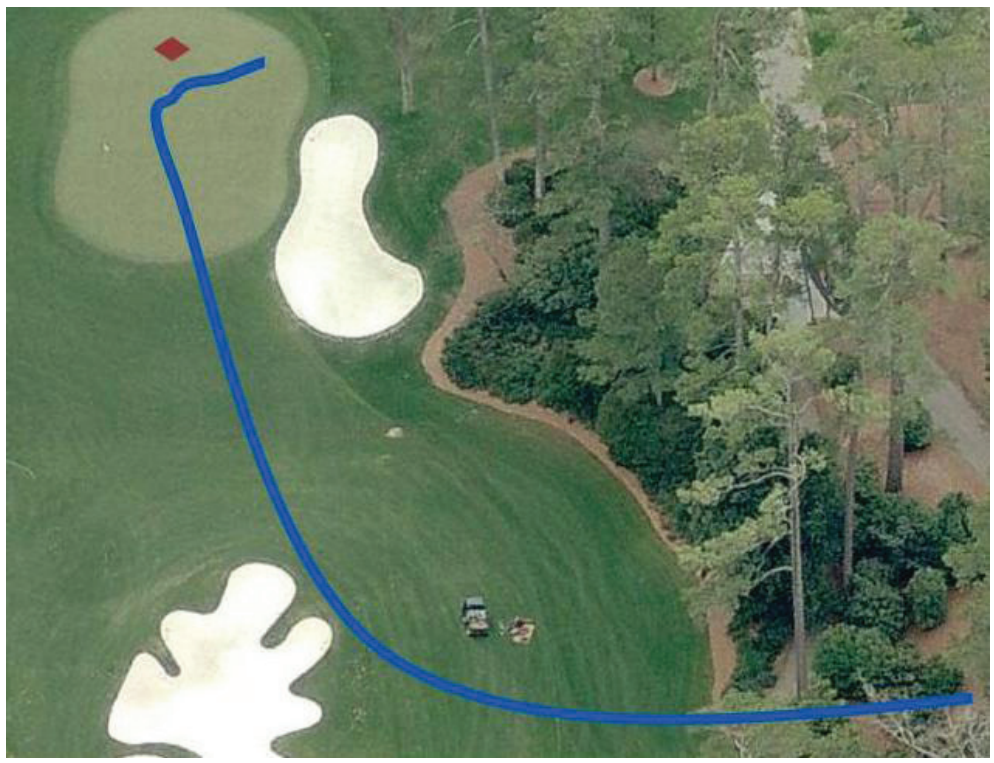
If the clubface is closed relative to the path the spin axis will tilt to the left and the ball will curve left.

O**ff-center hits**, have some overriding influence on the clubface. For a right-handed golfer when a ball is hit toward the heal of the club the spin axis of the ball tilts to the right (slice). A ball hit on the toe tilts the axis to the left (hook).

Also, the less loft that a club has, the more spin axis tilt is created for a given difference between face angle and club path. This is the reason why a driver curves more than a three wood and why is it easier to hit a pitching wedge straighter than a six iron.

As a point of reference, 5 degrees tilt of spin axis at 100 yards of carry produces 3.5 yards of curvature. If a driver carries 250 yards and has a spin axis of 10 degrees to the right the ball will curve 17.5 yards to the right of center.

When Bubba Watson hit his spectacular pitching wedge on the first playoff hole of the 2012 Masters the ball had approximately 38 degrees of spin axis tilt to the right on the ball. Watson had 164 yards to the hole and hooked the ball 40 yards.



We can only speculate as to the exact club parameters that would create that much spin axis tilt, but his path was at least 10 degrees to the left with the face 1-2 degrees left. Also, the ball was probably hit slightly off center toward the toe of the club. One of the best shot makers in golf today, Watson has great awareness of path and face. His ability to curve the ball was his key to winning the Masters!

In the next article we will explore the importance of centered contact and the effect of off center hits.