LAWS of the Game of GOLF
By James E. “Coach” Robertson
From his book “The Encyclopedia of Successful GOLF Coaching”

LAWS, Principles, and Preferences.

The Model Golf Swing
You can end your search for the one perfect golf swing. There is not one. Even if you found the perfect swing used by one of the many professional golfers, it is an illusion that their swing model would fit anyone else exactly.

Early in our lessons, we cover the laws of physics governing the creation and transfer of energy from the face of a club to a golf ball because these laws are foundational to your entire game. Ignorance of these laws is no excuse! Learn laws and principles and then develop putting techniques that comply with them.

During this lesson we will be reviewing, reinforcing, and adding to your understanding of:

- ball roll and path;
- mental models (blueprints) that drive physical execution of techniques;
- the physical reaction of the golf ball to the putter face at the moment of impact;
- proper setup (grip, ball position, posture, stance, aim, and alignment);
- body movement (or rotation) that produces specific putter face paths and velocity;
- identifying your preferences in ball path and roll;
- mental models (blueprints);
- stroke techniques and biomechanics;
- LAWS, Principles and Personal Preferences; and
- the illusive nature of touch.

Laws and Principle govern the transfer of energy, not preferences….Universal laws govern the game of golf, not personal preferences. Golf mechanics operate according to these laws. There is a great deal of room for individuality and personal preferences in the game, as long as they are founded on laws and principles.
A Technically Sound Stroke
Fit the following definition of a technically sound golf swing on for size and determine what you think.

“A mechanically (technically-our addition) sound golf swing (or with the putting stroke for your work in this book) delivers the clubface through the ball perfectly square with the target line, perfectly vertical, so that only the loft of the club affects the trajectory of the shot, on the correct path, with maximum velocity at the bottom of the swing arc every single time.”  Source:  Doc Suttie’s book Your Perfect Swing, p. 7.

Your thoughts and comments on the previous definition of a technically sound swing, or the observations from your golf coach or swing instructor:
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Questions on a technically and mechanically sound stroke or swing, and its influence on the golf ball at the moment of impact, for your coach or instructor:
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80% to 90% Error Rate
“Your setup writes the script for your golf swing” says Mike Adams, p. 57, in The LAWS of the Golf Swing. “We estimate that over 90% of all swing errors are caused by a faulty setup.”
LAWS and Principles

You may not need to be reminded that LAWS and principles are foundational, govern the transfer of energy from the putter face to the ball, apply to ALL styles of putting, and to the full swing. Newton’s 3rd law also makes golf a ground reaction sport, but more on that in a minute.

First, we will help you understand a few of the laws of physics and help you apply them within your putting stroke. With both pendulum and gate strokes, the following laws work to create the initial direction and speed of the golf ball, and apply to the full swing as well.

Through impact, the primary determinants of a golf ball’s initial direction and speed are the putter face’s:

- Sweet Spot or Center of Percussion;
- Path;
- Face Angle;
- Angle of Attack; and
- Force (mass and speed).

Reminder: these laws apply to ALL putting styles.

Center of Percussion or Centeredness.

Centeredness: The Center of Percussion is the ideal and most balanced spot on the putter’s face to strike the ball with.

Striking the golf ball on the Center of Percussion (COP) transfers the greatest amount of available energy from the club face to the ball and starts the ball on a line perpendicular to the club face. Remember that all putts begin as straight putts.

In the drawing above, illustration 1 is where the center of percussion of the putter’s face strikes the back-center of the ball, transfers full force potential, and moves the ball straight down the target line.

In illustration 2, the putter face strikes the back of the ball out toward the toe of the putter face, transferring less energy to the ball. In this example, the putter face has a tendency to rotate open in reference to the target line and propels the ball to the right of the line.

In illustration 3, the putter face strikes the back of the ball toward the heel of the putter, transferring less energy to the ball, and the putter face has a tendency to rotate closed in reference to the target line and send the ball off line to the left.

**Striking the golf ball on the center of percussion of the putter face is a top priority.** Striking the golf ball exactly on the sweet spot impacts both the amount of energy transferred to the ball and the ball’s direction, making this a double opportunity for performance.
Preparation Sequence: Isolate, improve, and integrate.
[Remember to separate the habituation process from play. They are two separate processes.]

Player: Coach, I’ve come up with a way of explaining preparation that makes better sense to me.
Coach: What is it?
Player: For practice, I’ve started isolating one of the laws I’m working on or checking out, such as center of percussion. Then I use one of the drills you gave me to improve on how that technique works within the law, which is the improve part of the sequence. I finish each session by making a putting stroke with my 6-Step Routine, just as if I was playing, which is integration. In the integration step, I allow the change, or technique I’m working on, to operate on autopilot.

Coach: How is it working for you?
Player: Fine. I am learning to evaluate from feedback how well my preparation is going and my feedback is getting much more specific.

Preparation versus Practice
One of our players used the term preparation in place of practice and his emphasis has always made sense to us. We see far too many players out on the range or golf course beating balls and merely getting their practice time in. Preparation has a more different goal directed connotation.
IMPLEMENTATION is an important key to being successful and to reaching your goals this game. In habituating techniques aligned with the physical law dealing with *Center of Percussion*, we recommend that you continue working with your local golf professional and perhaps use one of several training devices designed to assist you in drilling for skill. If you want help selecting such a device, you can e-mail Coach Robertson for suggestions.

*Do not forget to have a professional check the center of percussion of your putter and ensure that it is marked and balanced correctly.

Notes on Center of Percussion—also include any questions you have for your teaching professional or golf coach:

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Face Angle – the next LAW

The angle of the putter’s face in relation to the target line, as it transfers energy to the golf ball, is key in determining the direction and speed of the ball.

Because all putts start out as straight putts, the ideal face angle at impact is **square** with the target line, which is shown as 1 above. Being square means that the putter face forms a 90 degree angle with the target line. 90 degrees is the same as perpendicular. An important objective for your putting stroke is having the putter face perpendicular with the target line through impact, however, some very good professional golfers express varying preferences on this topic.

Illustration 2 is *Open*; the face of the putter is open (at more than a 90 degree angle with the target line) at impact, the golf ball is propelled to the right of the target line, and with some energy loss. That is the law.

When the face angle of the putter is closed (at less than 90 degrees) at impact such as in Illustration 3., the golf ball is propelled to the left of the target line with some energy loss.

**IMPLEMENTATION** is key. In habituating techniques that comply with the physical dealing with Face Angle, continue working with your local professional instructor and perhaps use one of several training devices designed to assist you. If you want help selecting such a device, you can e-mail Coach Robertson for suggestions.

*Have a professional check the face angle of your putter and ensure that it is properly aligned with the shaft and grip of the club.*

Notes on Face Angle—or questions for your instructor or coach:

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**Assessment and Training Aid**

- **Golf Around the World**’s “Pin Balls” (2 golf balls attached in the middle)
- Refer to **Golf Around the World (GAW)** for other training aids
- Other (list other preferences here):
**Path**

We are referencing the path of your putter’s face as it passes through the ball at impact. This is another major determinant of how the ball will travel in relation to the target line.

Your posture, the connection of your hands with the club, stance, and alignment all influence the path created with the putter’s face through impact—more on these techniques later.

In the first example above, when the path of the putter face is parallel with, or traveling along, the target line through impact, the golf ball is propelled straight down the target line, which is our preference. An important consideration in the putting stroke is having the putter face travel straight along the target line a few inches prior to, through, and a few inches past, impact.

In example 2, when the path of the putter face travels from outside the target line, through the ball, and to the inside on the follow through, the golf ball is propelled to the left of the target line. There is typically, however, no loss of energy transfer.

In example 3, when the path of the putter face is traveling from inside the target line, through the ball, and to the outside on the follow through, the golf ball is propelled to the right of the target line. There is typically no loss of energy transfer.

**Assessment and Training Aid**

- *Golf Around the World’s “Putting Arc”*
- *GAW “High Tech Putting Track”*
- Two alignment clubs on the green, set up parallel to each other
- Video Feedback
- Place an 18 inch piece of string on two tees, with the tees in the green, and work toward putting down the line of the string…all putts start out as straight putts.

**IMPLEMENTATION.** Be certain to implement techniques that comply with the law of physics dealing with *Path*. We recommend you use one of several training devices to assist you in assessing your stroke and drilling for skill. For help selecting such a device, you can e-mail Coach Robertson for suggestions.

Notes on Path—or questions for your golf instructor or coach:
Loft

Review: one of our objectives in a mechanically sound stroke is returning the putter’s shaft to its original setup position. Our original position is perpendicular to the green, or forming a 90 degree angle; such as in the first Illustration to the right.

The perpendicular position of the shaft, and thus the putter face, in example 1, is particularly influential in the putting stroke because the typical putter is manufactured with only 4 — 5 degrees loft, which is not very much. Therefore, even minor position differences in relation to the putter’s face angle, or loft, with the putting surface can make large differences. The objective is to position the putter shaft perpendicular with the green in your setup and return it to that exact position at the moment of impact.

In the second example, the putter shaft, and thus the putter face and loft, is more lofted (more than a 90 degree angle with the shaft). With more loft, there is actually less energy being transferred from the putter face to the golf ball. With additional loft comes additional back spin, which is exactly opposite of what we want in the putting stroke. In putting, we want the ball over spinning as quickly as possible, which helps the ball remain on line. Loft is typically added to the putter’s face when the golfer’s hands are behind or late in the stroke.

In example number 3, the putter shaft, and thus the putter face are de-lofted (less than 90 degrees). In this position, the golf ball not only receives less energy from the putter face, but is more apt to be pinched between the putter face and the green, and thus jump off line. Loft is typically reduced in the putter’s face when the golfer’s hands are ahead or early in the stroke.

Many golfers associate the concept of loft with woods and irons but not with putters. The typical putter has 4 — 5 degrees of loft. If the putter face had 0 degrees loft, what would happen upon impact with the golf ball? Think about your driver for just a second. With 0 degrees loft, the clubface could not depart any backspin to the ball, which is what keeps the ball airborne. The same LAWS of energy transfer apply to your putter. Without loft, or with negative loft, the putter face could pinch the golf ball between the ground and the face, the ball would pop up or sideways slightly, and roll off path.

Years ago, when greens were cut longer than they are today, putters had even more loft in order to getting the ball up on top of the grass and rolling faster. Even today, some players use putters with more loft on greens that are cut long and with courser types of grass, and use putters with less loft for greens cut shorter and with finer grass hybrids.

Do you know what degree of loft of your putter is?
Assessment and Training Aid
- Video Feedback
- Other (list other preferences here):

**IMPLEMENTATION** is your key to being lowering your golf score.
*Have a professional check the loft of your putter and ensure that it gets the ball rolling correctly and with the correct spin.

Notes on Loft: ___________________________________________________________
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**Reminder on Hand Position**
Notice the perpendicular position of the putter shaft to the green. Maintain a position with the hands and arms that allows you to keep the putter shaft in a perpendicular position at address and through impact. **Ensure that you maintain a consistent hand, arm, and shoulder position at address.**
Lie Angle
Do you understand the following technical definition of lie angle? "The angle of the horizontal centerline of the shaft with the ground line, tangent to the sole at the centerline of the face."

In the drawing above, 1. illustrates the preferred lie angle, where the bottom of the putter face is parallel with the putting surface. Certain putters have unique shaped to their bottom lines, but having the bottom of the putter parallel with the putting surface is our preference. We recommend lie angle # 1.

Assessment and Training Aid
- GAM’s “Arc Guide”
- Video Feedback
- Other (list other preferences here):

IMPLEMENTATION
*Have a professional check the lie angle of your putter and ensure that it is properly aligned with the shaft.

Notes on Lie Angle—and questions for your golf instructor or coach:
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Proper lie angle is important in your putting game and CRITICAL in your full swing. One of our objectives is helping you learn important laws, principles, and preferences of putting and then transfer that knowledge and skill into your full swing.
**Angle of Attack**
Definition: The angle of attack is the vertical movement of the putter face through the forward stroke in relation to the golf ball and putting surface.

*Gate Stroke*
Relative to other strokes, there is less angle of attack with a *gate stroke* (the bottom example) because there is very little elevation off the putting surface through the stroke. The arc of the gate stroke is typically very flat, thus having little, if any, angle of attack. In general, there is less elevation in all putting strokes because they are a one-lever mechanic. One-lever means there are no angles, or wrist cock, created in the stroke.

*Pendulum Stroke*
A *Pendulum Stroke* (top example) has slightly more elevation in its vertical arc than with other putting strokes, and thus its angle of attack is greater. It is important to work on a consistent angle of attack with both stroke strokes. Information on the value of striking the ball with an ascending (moving up) path at impact will covered with you as well.
Club Head Speed

The speed (velocity) and mass (weight) of the putter face are the primary determinants of the amount of energy transferred to the golf ball. With the putter, mass is the quality of matter as determined from its weight and the distribution of that weight. All things being equal, a heavier putter (more mass) will propel a golf ball further than a lighter putter (less mass). You will find some players converting to heavier putters in order to gain a greater sense of touch. Rather than constantly adjust their strokes to the speeds of different golf courses, grasses, and areas of the country, some professional golfers utilize putters of the exact same specifications, with the exception of more mass for slower greens. We have more information on touch for you later on.

Energy, a quick lesson

When an object is in motion, such as a putter head or a golf ball, it is said to have kinetic energy. For an object that is moving, kinetic energy equals one half times the mass of the object, times the square of the velocity of the object. The formula is $E_K = \frac{1}{2}mv^2$.

Notice in the formula that mass, which is the weight of the putter head, is divided by two, and its velocity, which is the speed it is traveling, is squared. If you are going to add mass to the putter, or increase velocity, which has the greatest impact on the total amount of energy created? RIGHT, velocity, or putter head speed has more impact because it is squared. Keep this information in mind because we will be referring back to it.

Preview. We will soon discuss one of our foundational principles for a consistent putting stroke, which is to produce a consistent rocking (pendulum stroke) or rotating motion (gate stroke) of the upper body, and with no hand and wrist power sources. In this way, you can adjust the distance a putt travels by only changing the length of the stroke itself, which increases putter head speed, or velocity.

QUESTION: How do the previous LAWS apply to your definition of a mechanically sound putting stroke? We have reprinted one possible definition below to keep you from having to look back in your book.

“A mechanically sound golf swing (or with the putting stroke for your work in this book) delivers the clubface through the ball perfectly square with the target line, perfectly vertical, so that only the loft of the club affects the trajectory of the shot, on the correct path, with maximum velocity at the bottom of the swing arc every single time.” Source: Doc Suttie’s book Your Perfect Swing, p. 7.
**Our Recommendation**

Our recommendation is that you start developing appropriate stroke techniques which relate to each of the five laws we have discussed. Start with a fairly level putting surface and invest a minimum of fifteen minutes a day. *When working with a swing instructor of coach, only focus on ONE law, and its associated techniques and biomechanics, in each lesson.* Since it can take up to thirty days to create a new habit, this strategy may dictate that you work indoors and on a flat and level surface at least part of the time. After you have habituated the techniques associated with the laws of physics, we recommend you check your new stroke techniques out at least once a month. Consult your local golf professional or golf coach for appropriate putting surfaces, assessment, lessons, and training aids.

**Refining Your Senses-Force**

A practical way of refining a sense of force (or touch) in the putting stroke is with experience from trial-and-success. Determining how much force is required in each stroke is an art worth mastering. In order of implementation, we strongly suggest you select your putting style, work on habituating proper techniques around the five laws we presented (angle, loft, sweet spot, path, and angle of attack), and then refine force. Without a consistent mental model and stroke through the golf ball, there are simply too many variables for consideration in creating the ideal force for any given putt. Some instructors claim that the speed of putts is more important than direction, but we do not want to spark a debate. Correct speed can, however, allow you to take advantage of the entire width and depth of the cup; more on that topic later.

**REMINDER:** rehearsal, preparation, and develop your putting stroke (and full swing) with techniques that are in line with the appropriate laws. Think in terms of: Isolate, improve, and integrate. In PLAY (competition) employ a different formula: Visualize it—Trust it—Do it—Learn from it.
Golf – a ground reaction sport

_Ground Reaction Forces._ Forces generated against the ground, such as the force created by the feet in the golf swing.

It is important for golfers to recognize the fact that ground reaction force (GRF) is another law and not a personal preference. When a golfer pushes against the ground, or applies force to it, with their feet, such as in creating a backswing, the ground reacts with a force back on the golfer’s feet. This is Newton’s 3rd law. The law reads that force occurs in pairs, equal in size but opposite in direction. It is this ground reaction force which helps a golfer move forward as they walk down a fairway, and initiate the force for the golf swing.

In the putting stroke, this GRF is used to maintain stable legs, and thus a stable base, through the putting stroke. We will be covering GRF in greater detail in connection with the full golf swing in _Swing Techniques and the Mind’s Side._

One more LAW

Balls that stop short of the hole, and beneath (on the low side) the hole, DO NOT GO IN.

During a college golf tournament we had an associate track the putting results of every player over the course of two days on the 12th green. Of the total putting attempts made at the cup, 78.3% of the misses were short of the hole and on the low side of the cup. While our mini-study was by no means scientific, it does give us some insight into the putting mistakes most college players make.

How do you think this LAW impacts putting?

Collect some data on your next golf round and evaluate what your thoughts are?

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The Laws of the Spirit

While on the topic of laws, we would be remiss not to make you aware of Dan Millman’s book, _The Laws of the Spirit._ You may recognize Dan’s name as the author of _Way of the Peaceful Warrior._ If you have not read Dan’s LAWS, we highly recommend that you do so.

Example of a Mental Law

Mental models (blueprints) of the putting stroke drive the physical execution of techniques and the correct utilization of biomechanics.
Incorrect Thinking. In our Academy, a large percentage of stroke errors can be traced back to the root cause of incorrect thinking. Throughout our lessons, we will be working with you on breaking the thinking chain that keeps you from competing up to your full potential.

What three major in-correct thoughts or ideas has this section clarified for you? Work with your coach or instructor on these ideas.

a. ____________________________________________________

b. ____________________________________________________

c. ____________________________________________________

THE BEGINNING

Coach Robertson is a PGA Tour Instructor, Director of The St. Andrews Golf Academy, Staff Writer for The World Golf Teachers Federation, and Head College Golf Coach. Author of “Gateway to the Game of GOLF”, “The Golfer’s Profile System”, “The Golf Team Swing and Performance Manual”, and “The Encyclopedia of Successful Golf Coaching.” Coach always enjoys your feedback and can be contacted at RobertsonJames1876@hotmail.com, or through Skype at james.e.robertson (USA).