Everyone applauds the big hitters in golf. But putting, which requires concentration and a skill known as “reading the green,” is just as important. Hitting the ball straight toward the hole may not be enough to sink it. By using science, you can understand how fast or slow, how straight or curved, a ball moves across the grass. And then adjust the speed and direction of your swing to make the perfect putt.

**Green Speed**

How fast or slow the ball moves across a putting green is called the “speed of the green.” What makes it fast or slow? The type of grass, the height of the grass, the direction in which it grows, and even the amount of water on the green.

On a fast green, the ball takes longer to slow down and rolls a longer distance. On a slower green, the ball slows down sooner and rolls a shorter distance. But faster isn’t always better. The green should be fast enough to challenge players, but not so fast that a ball can’t stop near the hole.

Big differences between putting green speeds can make game play frustrating and even unfair. So golf courses do their best to make the speed the same on all their greens. One way they do that is by measuring their greens with a **Stimpmeter**.

**What’s a Stimpmeter?**

It’s a simple device that rolls a golf ball onto a putting green at a fixed speed, so that you can tell how fast or slow the green is.

It’s made of a 36-inch aluminum bar with a tapered point at one end (for holding steady in the grass), a notch near the other end (at 29.4 inches), and a V-shaped groove that runs between. The notch holds the ball in place until that end of the Stimpmeter is lifted to an angle of 21 degrees. At that height, the ball automatically releases, and **acceleration due to gravity** causes the ball roll down onto the green.

**Father of the Stimpmeter**

The Stimpmeter is named after its inventor, Edward S. Stimpson (on left), an accomplished golfer. He wanted a way to measure the speed of a putting green, so he made a prototype in 1936, and soon discovered that the speed of putting greens can vary a lot between courses, between greens on the same course, and even within a single green. The USGA Test Center modified his device in the mid-1970s to make it even more effective, and has been using it ever since.

(Copyright Unknown/USGA Archives)
The ball travels under constant deceleration and changing velocity as it rolls, until friction eventually causes it to stop. The less friction the ball encounters, the faster the green and the farther the ball rolls.

If you use the Stimpmeter three times first in one direction and then in the opposite direction, measure the distance the ball travels each time, and average the results, you can determine the speed of the green. Stimpmeter readings on American golf courses range from 7 to 12 feet, with championship courses on the higher (faster) end.

**Kinematics**
The Stimpmeter relies on the principles of kinematics, which describes motion in three ways: position, velocity, and acceleration. By releasing the golf ball from a constant angle and position, the Stimpmeter causes the ball to roll down the ramp each time with the same rate of acceleration (8.4 feet/sec²) and then onto the green with the same initial speed (6.4 feet/second). This constant starting speed lets you accurately figure out the speed of the green.

**Stable Stance**
The speed of the green isn’t the only challenge players face when putting. Developing an effective swing is just as important. You need to understand not only how hard to hit the ball, but also how your center of gravity changes if you want to have a swing that is both controlled and powerful.

When you stand at rest, your center of gravity is halfway between your front and your back, about two inches below your belly button. But it changes as you move, in response to your position and balance. As your body shifts through a golf swing, even a swing that seems as steady as a putt, your center of gravity shifts also.

There are no devices at the USGA Test Center that measure how a player putts. It takes practice and skill for you to learn your own best stance for a successful swing.

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The Most Famous Putter in Golf History?
It’s actually not one, but two putters owned by Bobby Jones, both of which he named Calamity Jane. Even though the first one was rusty and well-used when he got it, Calamity Jane I helped him win his first three majors. When it became too damaged to play with, he had an identical copy made and went on to win ten more championships. Calamity Jane II is now on display at the USGA Museum.
(Copyright USGA/John Mummert)
**Key Concepts**

**Acceleration**
The increase of an object’s velocity over time.

**Balance**
An even distribution of weight enabling an object to remain stable.

**Center of Gravity**
The point in an object around which all weight is evenly distributed and balanced.

**Deceleration (Negative Acceleration)**
The decrease of an object’s velocity over time.

**Friction**
A force between objects moving in different directions, when their surfaces touch each other and oppose each other’s motion.

**Gravity**
A force of attraction that pulls objects toward each other. The more mass an object has, the stronger its gravitational pull.

**Kinematics**
A branch of classical mechanics in the science of physics that describes motion through position, velocity, and acceleration.

**Position**
The place where an object is located.

**Read the Green**
To look carefully at the shape, slope, grass, etc., of a putting green to figure out the best way to putt the ball into the hole.

**Speed**
The measure of how fast an object travels a specific distance over a specific time.  
\[ S = \frac{D}{T} \]

**Speed of the Green**
How fast or slow the ball moves across a putting green.

**Stimpmeter**
A simple device that rolls a golf ball onto a putting green at a fixed speed, so that you can measure how fast or slow the green is.

**Velocity**
The measure of speed in a specific direction.
To further explore the science of **PUTTING**, the USGA/Chevron educational partnership, or the game of golf, please check out the following resources:

### The Swing: Putting

**USGA Test Center**  
[www.usga.org/equipment/overview/Equipment-Standards-Overview](http://www.usga.org/equipment/overview/Equipment-Standards-Overview)  
Information about the Test Center and the Rules of Golf

**NBC Learn: Science of Golf**  
Videos and lesson plans about the science of golf

**USGA Stimpmeter Instruction Booklet**  
Information about the history and use of the Stimpmeter

**Sports ‘n Science: Golf**  
Information about the science of golf, as well as other sports

### USGA And Chevron Stem Partnership

**USGA and Chevron: Partners in Education**  
[www.usga.org/chevron](http://www.usga.org/chevron)  
Portal to a variety of STEM-related experiences, funding, and other content

**STEMZone: Science of Golf**  
Information and activities related to the science of golf

**STEMZone and the World of Golf**  
(Kid Scoop News)  
[www.kidscooppnews.com/stem-zone](http://www.kidscooppnews.com/stem-zone)  
Information and activities related to the science of golf

### Golf

**USGA Museum**  
[www.usgamuseum.com](http://www.usgamuseum.com)  
Online exhibits and photos related to the history of golf

**Junior Links**  
[www.juniorlinks.com](http://www.juniorlinks.com)  
Information, resources, games, and more for young golfers