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What makes a golf ball?

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Words: Carin Hardisty. Compiled with the help of Jaco Kotze of The Golf Racket, Aaron Russell of TaylorMade-adidas Golf, and websites www.usga.org, www.golfball-guide.de, hsportsnscience.utah.edu, and www.scientificamerican.com.

Golf balls have come a far way since the days of the wooden- and the *featherie* ball (a leather pouch filled with wet feathers and coated with paint; the feathers would expand when they dried and create a compact ball).

The surface of the modern golf ball is covered in small *dents*, or dimples. What started off as a *defect* in the older versions, which were completely smooth, turned out to actually be a great innovation in getting the ball to travel further and higher — a smooth golf ball only travels about half the distance one with dimples would.

- Dimples help to reduce drag: when the ball moves through the air, the air right against the surface of the ball sticks to the surface and moves a lot slower than the air around the ball. Between the stuck air against the surface and the fast moving air is a boundary layer of slow moving air. This boundary layer of slow moving air is a source of drag – it lets the air stick to the surface and whip in behind the ball. This air behind the ball in turn creates a low pressure area, which creates a vacuum.

  Therefore, the thinner the boundary layer, the less drag. This is where the dimples come in. The dimples make the molecules in the boundary layer tumble against each other, which makes them move closer to the fast moving air and reduces the difference between the speed of the molecules and that of the ball. The airflow in a turbulent boundary layer on a dimpled ball is thinner than on a smooth one. When the layer is turbulent, due to the tumbling molecules, the ball loses less energy to the fast moving stream of air, which means less drag.
- Dimples affect the lift of the ball: when putting backspin on a ball, the airflow is warped around the ball, similar to the effect of air on an airplane's wing – the air pressure at the bottom is higher than on top and creates an upward force on the ball. The dimples in turn optimise this lift force.

Generally speaking the more dimples, the higher the ball flies, but too many dimples could mean the ball travels too high and not very far in distance. Each manufacturer has their own formula for the *ideal* number of dimples, but it is considered that the best number is between 300-400 dimples per ball.

The shape and size of the dimple also makes a difference to the flight of the ball and the distance covered.

- Shape: traditionally, dimples have a spherical shape, but some are hexagons.
- Dimples are typically about 0.38cm in diameter.
- Shallow dimples: more spin and the ball stays on a low flight.
- Deep dimples: increase lift and the ball stays in the air longer and rolls less.
- Small dimples: better control in the wind and a lower flight.
- Large dimples: higher and longer flight.

Construction

A ball can be made several ways:

- One-piece: ball for beginners and used at driving ranges. Thermoplastic polymer core;
- Two-piece with a solid rubber core and a thermoplastic polymer cover;
- Three, four or five-piece multi-layer construction: made with a solid construction (no windings or liquid-filled centre). It features a strong rubber core, intermediate layers consisting of a combination of rubber and ionomer (depending on performance and player target), and a cover made of either ionomer or urethane.

The outside of the golf ball can also be made from various materials, each with their own pros and cons.

- Urethane: either cast or thermoplastic urethane materials. This material allows golf manufacturers to use soft materials, for more control or spin, and provides excellent cut resistance.
- Surlyn: a durable outer material that offers good cut and abrasion resistance. It feels hard and has a lower spin rate.

The USGA (Unites States Golf Association) lists the following rules for golf balls:

- Weight: maximum 45.93gm. No minimum.
- Diameter: minimum 42.67mm.
- Velocity: maximum 274km p/hour

The ball should be designed to behave symmetrically.

Compression

Originally, the ball's compression rating was a measurement for the quality of three-piece balls, where a long rubber was wound around the core. The perception was that the tighter the wind, the better the ball performed.

Today, technology has improved and the compression rating relates to the deflection that a golf ball undergoes when it is subjected to a compressive load (how much the shape changes under constant weight).

Balls typically have a very low compression and the majority has a rating of 100 or lower.

- The lower the compression, the softer the feel.
- For every 1/1 000ths of an inch that the ball compresses, it drops a point down.