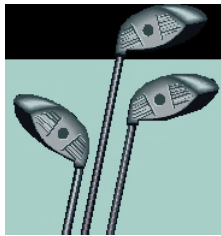


# Golf—From the Earth to the Moon

In the six centuries that people have been playing golf, the game has evolved dramatically. Players from 15th century Scotland would be amazed to see how the clubs and balls have changed and how elaborate the courses and rules are now. They would never



have thought that people would be using clubs whose shafts are made of aluminum or titanium instead of wood, and they would be astonished to see golf balls made of thermoplastic resins. Players in the 15th century made their own clubs and balls, using readily available wood and sometimes metal for the head of the clubs and leather and feathers for the balls. Not until the 16th century did players have professionals make their equipment. Until about 1850, players used

clubs with shafts made of ash or hazel and heads made of beech, fruit tree wood, or even hand-forged iron. With the industrial revolution in the 19th century, club makers started to make clubs with metal shafts, which gave the golfer better control over the ball and the ability to hit it out of difficult situations.



With the innovations of the 20th and 21st centuries, clubs are now being made of graphite, titanium, beryllium, copper, aluminum, carbon fibers, steel, tungsten, and alloys of these and other lightweight metals. Club heads have been redesigned to improve a golfer's game; grooves were added to the face to increase backspin, and the heads were made larger to make the ball fly higher. Golf balls have been made more durable and redesigned to fly longer distances, and club shafts are lighter and more resilient. Companies are experimenting with new alloys and other materials and new designs to make clubs lighter, stronger, more flexible, and add other characteristics that can help both professional and amateur players improve their game. Innovations have even affected the courses the game is played on;

changes in seed feed and fertilizers have improved the quality of the turf and made course maintenance more efficient.

All these changes have made the game of golf more accessible so that it has gone from a game that could only be played by those few who could afford it to being played in schools, community centers, and even on the Moon!



Titanium is mined in the United States in Florida, Georgia, and Virginia; more than half the titanium metal consumed in the United States, however, is imported rather than produced domestically. (Most titanium mined is not used in metal form but as titanium dioxide (TiO<sub>2</sub>), a white pigment in paints, paper, and plastics.)

No graphite is mined in the United States. China is the leading producer of graphite in the world, and the United States imports most of its graphite from China and Mexico.

For more information on the minerals used to make golf clubs, see the USGS minerals information Web site at <http://minerals.usgs.gov/minerals>.

#### Sources

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