



Smithsonian
National Museum of American History
Lemelson Center for the Study of Invention and Innovation



EDUCATORS' GUIDE

The invention of the electric guitar forever changed the sound of music. Watch this video and reach back in time more than 70 years to find out how the electric guitar became part of the American musical scene. Who were the instrument makers and inventors tinkering with guitars? Who were the musicians exploring new sounds?

“The Electric Guitar, Its Makers and Its Players” is based on an electronic field trip that was broadcast live from the Smithsonian’s National Museum of American History in Washington, D.C. on November 15, 1996.



Electric guitar pioneer Charlie Christian, ca. 1939-1941
From the collection of the Rock and Roll Hall of Fame and Museum

IN THE VIDEO, YOU WILL MEET A GUITAR MAKER . . .

Paul Reed Smith knew he was going to be a guitar maker by the time he was sixteen. He built his first guitar as a shop project in high school, and continued to experiment with guitar building during and after college. To test his experiments,

Smith began hanging out backstage at concerts, persuading musicians to try his instruments. Says Smith, “I guess I made about one guitar a month for ten years, and so I changed the design, guitar by guitar by guitar, until I came up with something the players really liked.”



Paul Reed Smith (left)
and G.E. Smith (right)

AND A GUITAR PLAYER . . .

G. E. Smith strummed his first guitar chords when he was only four years old. By the age of eleven, he was already making money playing the guitar. As a professional musician, he has performed and made recordings with such musicians as the Rolling Stones, David Bowie, Bob Dylan, and Hall and Oates. Smith also worked as the bandleader, musical director, and guitarist for the television program *Saturday Night Live*. It was there that he wrote the hit song to the movie *Wayne’s World*. Says Smith, “I’ve had an incredible ride in the world of rock ‘n’ roll. I wonder if it’s a coincidence that I was born on Mozart’s birthday!”

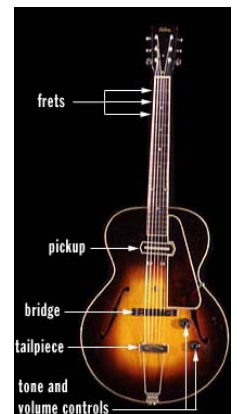
HOW GUITARS WORK

In an **acoustic (non-electrified) guitar**, sound is produced by striking the strings and making them vibrate. The energy of the vibrating strings is then transferred to the soundboard through the bridge. The guitar's hollow body amplified the sound of the vibrating strings.

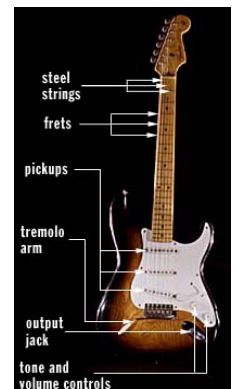
Experiments with electronic amplification in the 1920s and 1930s involved simply attaching a **pickup** to an acoustic guitar—creating the **electric-acoustic, or hollow-body electric, guitar**.

During the 1940s, makers and players began experimenting with solid body guitar construction. In a hollow guitar, the pickup can't tell string and body vibrations apart, jumbling the signal. In a **solid-body electric guitar**, the great mass of the body has minimal response to the vibrations of the strings. So the pickup "picks up" a cleaner signal of the strings' pure tone.

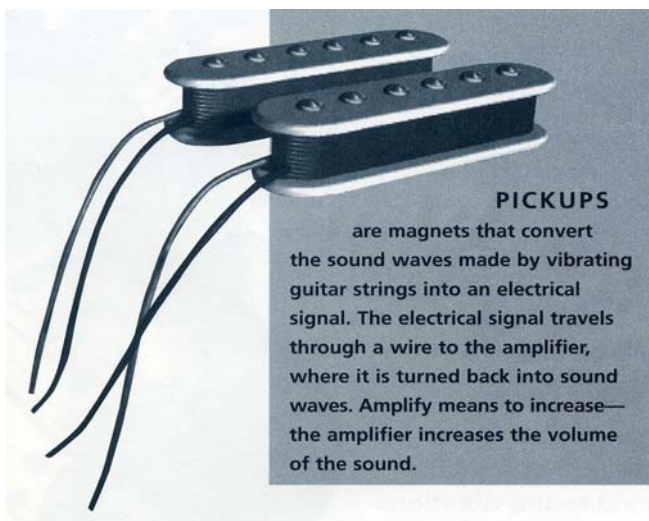
Since the 1960s, guitarists looking to achieve new, distorted sounds have plugged their instruments into **special-effects boxes** which change the signal from the pickups and thus the sound that the amplifier produces.



Hollow-body electric guitar



Solid-body electric guitar



To learn more about the invention and development of the electric guitar, please visit the Lemelson Center's Web site at:

invention.smithsonian.org/centerpieces/guitars

For comparative listening examples, enter either the frames or non-frames version of the site and select "How Guitars Work" from the left-hand menu.

GUITAR-BUILDING ACTIVITY

Supplies Needed:

- Shoe-box with lid
- Scissors or straight-edge razor
- Ruler
- Glue
- Four toothpicks
- Four large rubber bands of varying thickness
- Pencil
- A penny or soft drink tab

What to Do:

1. One inch from edge of shoe-box lid, cut a 3 inch square hole to create the **sound hole**.
2. Squeeze glue onto the toothpicks and attach them to the box lid, spacing them about 1 ½" apart from the inside edge of the sound hole to the opposite end of the lid. These are the **frets**.
3. Put the lid on the box and slide the rubber bands, from thickest to thinnest, around the box so they stretch across the hole like **guitar strings**.
4. Insert the pencil under the rubber bands at the end below the sound hole. This is the **bridge**.
5. Play the guitar by plucking the rubber bands with a **pick** (e.g. a penny or soft drink tab). Try making different sounds by holding down the rubber bands at alternating frets while plucking. Notice which rubber bands create lower or higher sounds.

Adapted from Alex Sabbeth's *Rubber-Band Banjos and a Java Jive Bass* (1997)



To learn more about electric guitars, here are some reading suggestions:

- Bacon, Tony, and Paul Day. *The Ultimate Guitar Book*. New York: Alfred A. Knopf, 1992.
- Gruhn, George, and Walter Carter. *Electric Guitars and Basses: A Photographic History*. San Francisco: GPI Books (Miller Freeman), 1994.
- Millard, André, ed. *The Electric Guitar: A History of an American Icon*. Baltimore: The Johns Hopkins University Press, 2004.
- Trynka, Paul, ed. *The Electric Guitar: An Illustrated History*. London: Virgin, 1993.
- Wheeler, Tom. *American Guitars: An Illustrated History*. New York: Harper Collins, 1990.