# WHAT MAKES A SMARTPHONE SO SMART?

Take a look inside, and you'll find that smartphones are multi-purpose information processors, with specialized sensors and other technology designed to function in dozens of ways

### 4G

Short for fourth generation, 4G is the mobile telecommunications technology that, through a network of wireless cell towers, enables ultra-fast Internet access for web surfing, high-definition mobile TV, video conferencing, and interactive apps, all on your smartphone.

### TOUCHSCREEN

Allows you to control your device by touch, by typing an on-screen keyboard, zooming in and out with a finger pinch, swiping to scroll a webpage or change screens, activating buttons and links, even securing your phone with your fingerprint.

### MICROPHONE

Transmits your voice when you make a call and provides your smartphone with an audio sensor that enables applications that provide voice-activated commands, speech-recognition software, and apps that can use audio to identify songs and sounds like song birds.

### CAMERA

Lets you take photos and videos, and equips the smartphone with a visual sensor that apps use to create Virtual Reality experiences, provide visual identification, scan QR codes, and even measure your heart rate by tracking changes in the light passing through your finger over the camera lens.

### INFRARED EMITTER

Can be used to turn your smartphone into a universal remote, capable of sending infrared signals to your TV and other devices, or used as a bar-code scanner. In some models, the infrared emitter is combined with other sensors that can recognize your hand gestures and let you control the phone itself without touching the screen.

### BAROMETER

Measures air pressure to help estimate altitude, so it can distinguish, for example, whether you are looking down at the top of a skyscraper or walking along the sidewalk.

### WI-FI

Wi-Fi® technology provides Wi-Fi-enabled devices (e.g., laptops, tablets, smartphones) with wireless access to the immediate local area network and is used in homes, schools, businesses, and other similar settings. Wi-Fi does not use 4G wireless networks for local connectivity and provides limited coverage.


### GYROSCOPE

Measures the orientation of the phone when you turn the device from side to side or up and down. This sensor is used to change your angle of view when you are playing a game or using a Virtual Reality app to search the stars or a new neighborhood.

### NFC

Near Field Communication creates a connection between two devices based on proximity, allowing you to transfer a file, photo, or information, and enabling your smartphone to serve as anything from a payment method at a store to an electronic ticket on a train.

### MAGNETOMETER

Measures the Earth's magnetic field to determine which way is North, so maps auto-rotate to match your orientation. This sensor also helps keep virtual reality apps aligned with the real world around you.

### BLUETOOTH

Bluetooth enables mobile devices equipped with the technology to send and receive information wirelessly over short distances. Using Bluetooth, electronic devices such as mobile phones, headsets, speakers, and your car's electronic systems can communicate over short ranges using the 2.4 GHz spectrum band. Bluetooth also powers fitness wristbands and door locks that can be opened automatically when you and your smartphone come home.

### THERMOMETER AND HYGROMETER

Sensors used to measure temperature and humidity. In mobile devices these sensors can help improve weather forecasting or track overall temperature trends, and can provide data for applications controlling the heating and cooling of smart buildings.

### GPS

Global Positioning System, a worldwide satellite navigational system, is made up of a constellation of satellites orbiting the earth with receivers on the earth's surface. The GPS satellites continuously transmit digital radio signals, received by your smartphone to allow it to pinpoint the device on maps and allow other applications to provide localized time, weather, and other information. Indoor positioning is provided by other sensors that help determine device position, and generally not by the GPS system, given the relatively weak strength of satellite signals.

### PROXIMITY EMITTER

A specialized sensor that recognizes when the phone is close to your face and turns off the touchscreen so you don't accidentally push a button with your cheek. This sensor can also adjust the volume for handheld calls.

### ACCELEROMETER

Measures speed and direction as you move the phone. This sensor changes the screen from portrait to landscape view, helps prevent blurry photos and jittery videos, and works with exercise apps to turn your smartphone into a pedometer.

## Want to see how wireless technology can boost your STEM studies?

Scan this QR code to download **STEM Mobile Labs**, a free app that brings together some of the best free Science, Technology, Engineering, and Math apps available for Apple and Android smartphones and tablets.

The Wireless Foundation

NOTE: Standard data rates may apply over cellular networks so consider Wi-Fi for app download and usage if necessary.