Nowadays most of us cannot imagine life without the electronic devices which surround us. They are everywhere, and often we even forget about their existence: mobile phones, TV sets, mp3 players, electronic watches or even alarm clocks. Most people do not reflect on how and why these everyday appliances work. But being a geek requires at least some basic technical knowledge about the surrounding world.

As you probably remember from early science lessons, the electric current is an organized flow of electrons and ions in a conductor. But to make those tiny particles move, there must be some kind of force.

In electronics, this force is called an electromotive force or EMF, which may be also described as voltage. For some, the definition of voltage as the difference of potential in the conductor may be a bit hard to imagine.

So to visualize this process, you may think of the difference in the number of electrons in the conductor. If there are fewer electrons in one part of a wire than another part, then there is a difference of electrons between points A and B of the electrical circuit.

Nature is organized in such a way that it aims at making this potential equal in both points of the circuit. So to make it equal, there is a need to move some of the electrons from one place to another. Current is exactly what we call this movement.

Of course we need to take our voltage from some electric source. One common source of power in smaller home appliances is batteries, or voltaic cells. The energy stored in batteries comes from chemical reactions that take place inside. But quite often we may replace the batteries with another source of energy, such as a solar cell, which may be found in simple calculators or electronic watches.

So, right now our circuit consists of a source (battery) and a path (a conductor in which the electrons flow). We need one more element that will consume the energy stored in the source of voltage. This element, called a load, could be a light bulb. Light bulbs contain a filament inside. The more electrons that flow through the bulb, the hotter the filament gets. At some point, the filament starts to glow with light. But sometimes this light might be too bright for us and we would like to dim it.

To dim the light, it is enough to add an additional element that will take away some energy from our circuit - a resistor. The greater the value (resistance) of this element, the bigger drop in voltage we experience. So, our first electrical circuit is done.

To assemble it we may use a printed circuit board or PCB, a laminate board with paths printed on it and the holes drilled to make place for electronic components. To attach the elements to the PCB we need a hand tool called a soldering iron or a soldering gun. This device heats the solder and enables us to attach our elements to the path.
Everyday appliances consist of much more sophisticated electronic components than our circuit, like for example capacitors which can store energy for a short time. Capacitors are used for example in photo cameras as a source of energy for flash bulbs. Capacitors store voltage from batteries, and when needed the load is discharged rapidly so you can see the burst of light. There are also light-emitting diodes which are more and more common sources of light in our homes.

Due to the vast development in technology, electronic circuits get smaller and smaller every year. Usually they can be found as integrated circuits or IC - small chips that consist of various components that are inseparable. However, to fully understand the way electronic devices work, it is perhaps best to learn the basics of electronics with simpler and larger models. There is no substitute for manual practice under the supervision of experienced users of the soldering gun.

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**Discussion Questions**

What kinds of skills are necessary to practice electronics? How safe it is?

Have you ever built and soldered your own PCB? If yes, explain the purpose of this circuit. If not, explain why you were not interested in such things.

What is, in your opinion, the future of electronic devices? Are they making our life easier or are they dangerous?