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whose chemical reactions create a flow of electrons in a circuit. All batteries are made up of three basic components: an anode (the '-' side), a cathode (the '+' side), and some kind of electrolyte (a substance that chemically reacts with the anode and cathode). When the anode and cathode of a battery is connected to a circuit, a chemical reaction takes place between the anode and the electrolyte. This reaction causes electrons to flow through the circuit and back into the cathode where another chemical reaction takes place. When the material in the cathode or anode is consumed or no longer able to be used in the reaction, the battery is unable to produce electricity. At that point, your battery is "dead." Batteries that must be thrown away after use are known as primary batteries. Batteries that can be recharged are called secondary batteries. Lithium polymer batteries, for example, can be recharged Without batteries, your quadcopter would have to be tethered to the wall, you would have to hand crank your car, and your Xbox controller would have to plugged in all the time (like in the good old days). Batteries offer a way to store electrical potential energy in a portable container. Batteries come in a variety of shapes, sizes, and chemistries. The invention of the modern battery is often attributed to Alessandro Volta. It actually started with a surprising accident involving the dissection of a frog. What You Will Learn The following topics will be covered in detail in this tutorial: How batteries were inventedWhat parts make up a batteryHow a battery worksCommon terms used to describe batteriesVarious ways to use batteries in circuits Suggested Reading There are a few concepts that you might want to be familiar with before starting to read this guide: Looking to explore different batteries? We've got you covered! PRT-13851 This is a very small, extremely lightweight battery based on Lithium Ion chemistry, with the highest energy density currently PRT-12895 No, these aren't some sort of weird, AA battery, this is actually a 18650 Lithium Ion Cell. These round high capacity cells h PRT-00338 CR2032 Lithium metal 3V 250mAh button cell battery. Great for powering low power processors or blink an LED for weeks at a ti PRT-10218 These are your standard 9 Volt alkaline batteries from Rayovac. Don't even think about trying to recharge these. Use them wit Historically, the word "battery" was used to describe a "series of similar objects grouped together to perform a function," as in a battery of artillery. In 1749, Benjamin Franklin first used the term to describe a series of capacitors he had linked together for his electricity experiments. Later, the term would be used for any electrochemical cells linked together for the purpose of providing electric power. Battery of Leyden jar "capacitors" linked together(image courtesy of Alvinrune of Wikimedia Commons) Invention of the Battery One fateful day in 1780, Italian physicist, physician, biologist, and philosopher, Luigi Galvani, was dissecting a frog attached to a brass hook. As he touched the frog's leg with an iron scapel, the leg twitched. Galvani theorized that the energy came from the leg itself, but his fellow scientist, Alessandro Volta, believed otherwise. Volta hypothesized that the frog's leg impulses were actually caused by different metals soaked in a liquid. He repeated the experiment using cloth soaked in brine instead of a frog corpse, which resulted in a similar voltage. Volta published his findings in 1791 and later created the first battery, the voltaic pile, in 1800. The voltaic pile consisted of a stack of zinc and copper plates separated by cloth soaked in brine Volta's pile was plagued by two major issues: the weight of the stack caused the electrolyte to leak out of the cloth, and the particular chemical properties of the components resulted in a very short life span (about an hour). The next two hundred years would be spent perfecting Volta's design and solving these issues. Fixes to the Voltaic Pile William Cruickshank of Scotland solved the leakage problem by laying the voltaic pile on its side to form the "trough battery." The trough battery solved the leakage problem of the voltaic pile The second problem, short life span, was caused by the degradation of the zinc due to impurities and a build up of hydrogen bubbles on the copper. In 1835, William Sturgeon discovered that treating the zinc with mercury would prevent degradation. The British chemist John Frederic Daniell used a second electrolyte that reacted with the hydrogen, preventing buildup on the copper cathode. Daniell's two-electrolyte battery, known as the "Daniell cell," would become a very popular solution to providing power to the budding telegraph networks. A collection of Daniell cells from 1836 The First Rechargeable Battery In 1859, the French physicist Gaston Plant created a battery using two rolled sheets of lead submerged in sulfuric acid. By reversing the electrical current through the battery, the chemistry would return to its original state, thus creating the first rechargeable battery. Later, in 1881, Camille Alphonse Faure improved Plant's design by forming the lead sheets into plates. This new design made the batteries easier to manufacture, and the lead acid battery saw wide-spread use in automobiles. -> The design for the common "car battery" has been around for more than 100 years(Image courtesy of Emilian Robert Vicol of Wikimedia Commons)

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