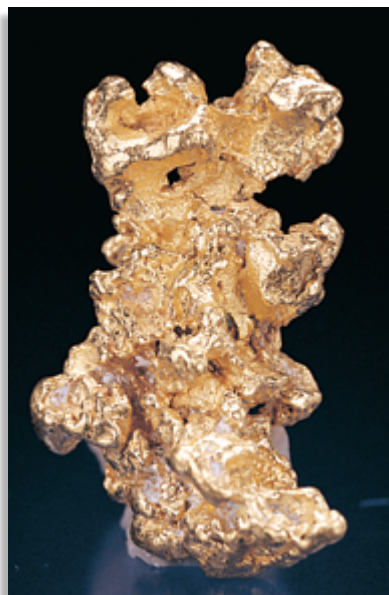


Chemistry in Action

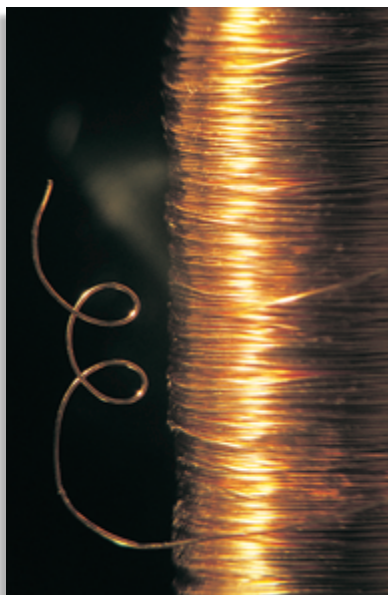
Superconductors

Any metal becomes a better conductor of electrical energy as its temperature decreases. In 1911, scientists discovered that when mercury is cooled to about -269°C , it loses all resistance and becomes a superconductor. Scientists have long tried to find a material that would superconduct at temperatures above -196°C , the boiling point of liquid nitrogen. In 1987, scientists discovered ceramic materials that became superconductors when cooled only to -183°C . These "high-temperature" superconductors are used to build very powerful electromagnets. Ceramic electromagnets are used in medical magnetic resonance imaging (MRI) machines and in high-efficiency electric motors and generators.

FIGURE 13 (a) Gold has a low reactivity, which is why it may be found in nature in relatively pure form. (b) Copper is used in wiring because it is ductile and conducts electrical energy (c) Aluminum is malleable. It can be rolled into foil that is used for wrapping food.



(a)



(b)



(c)

Types of Elements

The periodic table is broadly divided into two main sections: metals and nonmetals. As you can see in **Figure 12**, the metals are at the left and in the center of the table. The nonmetals are toward the right. Some elements such as boron and silicon show characteristics of both metals and nonmetals.

Metals

Some of the properties of metals may be familiar to you. For example, you can recognize metals by their shininess, or metallic luster. Perhaps the most important characteristic property of metals is the ease with which they conduct electricity and transfer energy. Thus, *a metal is an element that is a good electrical conductor and a good heat conductor.*

At room temperature, most metals are solids. Most metals also have the property of *malleability*, that is, they can be hammered or rolled into thin sheets. Metals also tend to be *ductile*, which means that they can be drawn into a fine wire. Metals behave this way because they have high *tensile strength*, the ability to resist breaking when pulled.

Although all metals conduct electricity well, metals also have very diverse properties. Mercury is a liquid at room temperature, whereas tungsten has the highest melting point of any element. The metals in Group 1 are so soft that they can be cut with a knife, yet others, such as chromium, are very hard. Some metals, such as manganese and bismuth, are very brittle, yet others, such as iron and copper, are very malleable and ductile. Most metals have a silvery or grayish white *luster*. Two exceptions are gold and copper, which are yellow and reddish brown, respectively. **Figure 13** shows examples of metals.