

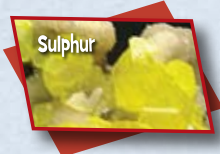


FIGURE SKATING

Figure Skating originated in the mid-1800s, but was quite stiff and formal compared to the modern version. Skaters had to carve specific figure-eight-based patterns on the ice (hence the name Figure Skating). In the mid-1860s, dance moves and expressive techniques were introduced to the sport, as was the two-plate all-metal blade. In the 1870s, the addition of toe picks to the blades made toe pick jumps possible. By the 1900s, Figure Skating had become much more athletic, involving challenging moves such as Canadian Elvis Stojko's quadruple/triple jump combination in 1997. The compulsory figures were phased out by 1990.

Modern Figure Skating is divided into four categories: single skating events for men and women, pair skating, ice dancing, and synchronized skating. The first Olympics to feature Figure Skating were held in England, in 1908.

Sulphur (s)

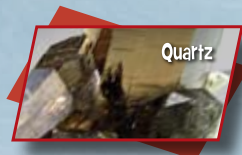


Top Producers:
U.S., Canada, China, Japan

Sulphur is a bright yellow to yellowish-brown, brittle, non-metallic element. It is the 10th most abundant element in the known universe and ranks 14th in the Earth's crust. Sulphur is recovered as a by-product of oil refining and natural gas processing and is poured in hot liquid form into blocks to cool. It is used in the production of almost everything we eat, wear, or use. Combining sulphur with rubber and heat makes vulcanized rubber, the hard and durable material that forms hockey pucks.

Known as the "King of Chemicals," sulphuric acid is the major end use for sulphur. It is such an important industrial raw material that sulphuric acid consumption has been considered one of the best indexes of a nation's industrial development.

Silica (SiO₂)



Produced widely around the world

Silica minerals make up approximately 12 per cent of the Earth's crust. Quartz, a hard mineral that is the most commonly occurring form of silica, eventually becomes silica sand through the process of erosion. It survives the journey along riverbeds, where softer minerals are ground away, reaches the sea, and collects along beaches. Silica is the main ingredient of nearly all glass and also goes into plastics, electronic parts, and silica steel, as well as the fibreglass used for hockey helmets and sledge hockey seats. Heated silica also becomes silicon, which is used in silicon chips and LEDs (light emitting diodes), both found in electronic scoreboards.

Amethyst, opal, and citrine are all beautiful gem forms of silica used in jewellery and decorative objects since ancient times.

ICE HOCKEY

The origin of the game of Ice Hockey is uncertain. Some say that it originated with centuries-old European stick and ball games—such as Irish hurling and English bandy (field hockey on ice)—and some say it is based on Aboriginal lacrosse or Mi'kmaq field games. But what is certain is that the modern game of hockey was born in Canada. The first game of what we recognize today as Ice Hockey was played in 1875 in Montréal, Québec, and official rules were drafted at Montréal's McGill University in 1879. By 1893, Ice Hockey was being played in the U.S. and, by the early 1900s, it had found its way to the U.K. and Europe. The sport was added to the Olympic Games in 1920.



Russian, American, and English skaters covering four distances—500 m, 1,500 m, 5,000 m, and 10,000 m.

Canada's first recorded Speed Skating race took place on the St. Lawrence River in 1854, when three British army officers raced from Montréal to Québec City. In 1887, the Amateur Skating Association of Canada staged its first official championship. In 1897, three countries—Norway, Germany, and Canada—competed in the World Speed Skating Championship in Montréal, with the world title going to Winnipegger Jack McCulloch. In 1924, Speed Skating became part of the Olympic program.

Aluminum (Al)

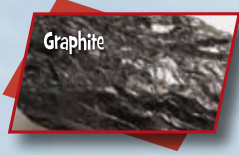
Top Producers:
Australia, China, Brazil, India, Guinea

Aluminum, a metal extracted primarily from the rock bauxite, is lightweight, easily shaped, easily machined and cast, and has tremendous corrosion resistance and durability. Its uses are varied, from hockey sticks and sledge frames to pop cans, foil wrap, and airplane propellers.

A 7.25-tonne block of aluminum measuring 4.5 m x 1.5 m x 45 cm produces a .2 mm thick sheet of aluminum foil over 12.5 km long.



Graphite (C)



Top Producers:
China, India, Brazil, North Korea, Canada

Graphite is a soft, crystalline form of carbon. It is grey to black, has a metallic lustre, and occurs in metamorphic rocks, such as marble, schist, and gneiss. It has both metallic and non-metallic properties. As a metal, it conducts heat and electricity; as a non-metal, it is inert (does not react with other chemical compounds or elements), and provides high heat resistance and excellent lubrication. Major uses of graphite include high-temperature lubricants, brushes for electrical motors, friction materials, brake linings, and battery and fuel cells. Carbon fibre graphite composites are used to make fishing rods, golf clubs, bicycle frames, and hockey sticks.

Early writing tools were often made with lead. Today we still call the core of a pencil the "lead," even though it is made from non-toxic graphite.

SPEED SKATING

The world's first organized Speed Skating race, slightly more than 24 km, was held in 1763 in England. Eventually, the sport came to North America, where a lighter, sharper, and longer all-steel blade was introduced in 1850. The first modern Speed Skating competition was held in Norway in 1863 and in 1885, the first major International Speed Skating race was held in Germany. In 1889, the first world championship saw Dutch,



Titanium (Ti)

Top Producers:
Australia, South Africa, Canada, China

Titanium, from the minerals rutile and ilmenite, is the fourth most abundant metal in the Earth's crust, but is difficult to isolate. It is lightweight, corrosion resistant, easily worked, and able to withstand temperature extremes. These properties suit the aerospace industry, the single largest market for titanium alloys. Titanium alloys also go into products ranging from hockey sticks and skis to springs, exhaust systems, and medical devices such as artificial hips and knees.

Most titanium is produced to make titanium dioxide, used for white pigment in everything white, from paint to toothpaste. In sunblock, it helps protect your skin from ultraviolet light.



CUTTING EDGE

SKATES

have come a long way from a pair made of animal bones from 3000 B.C. and the first iron ones from 200 A.D. Around the 14th century, the Dutch began strapping wooden platforms with flat iron bottom runners to their shoes, and using poles to push themselves forward. In the 1500s, they changed the runners to a narrow double-edged blade that allowed them to push and glide with their feet (called the "Dutch Roll"), making the poles unnecessary. Today, high-tech steel blades support speed skaters, figure skaters, and hockey players in their quest for speed, grace, and goals.

Steel is an alloy of iron with other metals, such as carbon, nickel, chromium, manganese, and molybdenum, depending on the type of steel needed. Some of the earliest steel dates back to 1400 B.C. Today, steel is one of the most common materials in the world and is a major component in many manufactured items, including buildings, tools, automobiles, appliances, and sports equipment.

The steel industry has been actively recycling for more than 150 years. In fact, steel is the most widely recycled material in Canada—it is more economical to recycle steel than to mine iron ore for new steel. Steel lends itself well to recycling because it does not lose any of its physical properties during the recycling process. The energy saved by recycling steel in Canada each year saves enough energy to power 2.7 million households.

Chromium (Cr)

Top Producers:
South Africa, Kazakhstan, India

Chromium, a hard metal that takes a high polish, is found primarily in the mineral chromite. It contributes hardness, toughness, and chemical resistance to steel and other alloys. Chromium chemicals are used for tanning leather and as coloured pigments in paints, plastics, and ceramics. Chromium plating gives a corrosion-resistant, high-polish finish to skate blades and hockey mask cages, as well as decorative and industrial items.

A form of chromium occurs in many foods, such as apples, peas, and Swiss cheese. It keeps you healthy by balancing blood sugar, fat and cholesterol levels; regulating hunger; and aiding heart functions.



Iron (Fe)

Top Producers:
China, Brazil, Australia, India, Russia

Iron, obtained from the minerals hematite and magnetite, is the most abundant metal on Earth. It is the main element in steel, an essential element of industrial society. In that form, iron is used 20 times more than all other metals combined. Iron is in stainless and carbon steel used for skate blades, hockey mask cages, and sledge hockey frames, as well as machinery parts and the steel rebar that reinforces sports venue buildings.

Hematite is usually silver to black in colour, but is bright red in powder form. It gets its name from a Greek word meaning blood-like and was believed to form where blood had been spilled in battle.

Nickel (Ni)

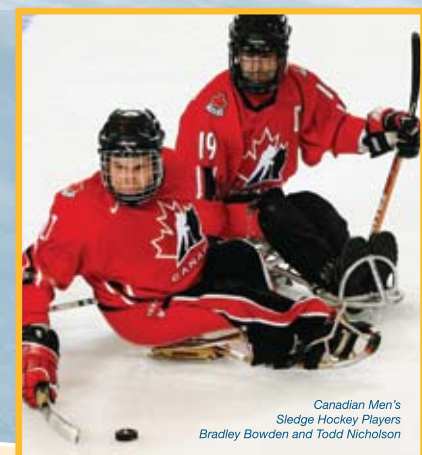
Top Producers:
Russia, Canada, Indonesia, Australia

Nickel, a product of laterite deposits, such as garnierite, and sulphide ores, is hard but easily shaped. Used primarily to make stainless steel, nickel also has excellent plating qualities that suit it to industrial and decorative coatings. Nickel is in stainless steel skate blades, hockey mask cages, and sledge hockey frames. Alloys containing nickel go into many automotive parts, such as exhaust systems, thermostats, spark plugs, gears, and electronics, components also found in an ice resurfacing machine.

Nickel-containing batteries keep you connected—they keep your cellphone, laptop, and digital camera alive when you are on the move.



Ice, training, muscle, passion, determination...
skaters need them all to get to the top of their sport.
But there's more. The equipment, the venues...
MINING MAKES IT HAPPEN



SLEDGE HOCKEY

Sledge Hockey is a fast-paced, highly physical game invented during the early 1960s in Stockholm, Sweden. Athletes sit in a metal frame sled, or sledge, mounted on two regular-sized Ice Hockey skate blades, that allows the puck to pass underneath.

The first international Sledge Hockey game took place in 1969 between Swedish and Norwegian teams. In 1981, Great Britain started a team, followed by Canada in 1982, and the U.S., Estonia, and Japan in the 1990s. In 1994, Sledge Hockey debuted at the Paralympic Winter Games in Lillehammer, Norway. Team Canada won their first gold medal in 2006 at the Games in Torino, Italy. Canada, Norway, the U.S., Germany, Sweden, and Japan are currently regarded as the top Sledge Hockey nations.

In the Arena... MINING MAKES IT HAPPEN

WINNING MEDALS

Athletes vie for top honours and medals in competitions around the world; the world's best strive to win Olympic medals. Olympic medals are designed specially for each individual Olympic Games by the host city's organizing committee. Each medal must be at least 5 mm thick and 70 mm in diameter. The gold and silver medals must be made from 92.5 per cent silver, with the gold medal covered in 6 g of gold.



For the Vancouver 2010 medals, the Royal Canadian Mint produced 615 Olympic and 399 Paralympic medals, using metals provided by Canadian company Teck Resources. The medals weigh between 500 and 576 g, making them among the heaviest medals in Olympic and Paralympic history. Their content includes—for the first time ever—gold, silver, and copper recycled from end-of-life electronics. Their groundbreaking designs feature Aboriginal art on undulating shapes that suggest the rolling waves, drifting snow, and mountains of the Canadian landscape.

Bronze is a copper alloy, usually copper mixed with tin. The use of bronze significantly affected the development of human culture. We call the period from 3500 B.C. to 1200 B.C. the Bronze Age, since the discovery of the alloy improved the making of tools, weapons, armour, and building materials. Bronze still has many applications, including the manufacture of bells, musical instruments, and medals. Bronze parts are also used for bearing clips, electrical connectors, springs, and roofing materials.

Copper (Cu)

Top Producers:
Chile, U.S., Peru, China, Australia

Copper, the first metal smelted from ores, is easily shaped and is an excellent heat and electricity conductor. One of the most important copper ores is the mineral chalcopyrite. Copper has an unusual pinkish lustre, but when exposed to air and water, it oxidizes, developing a blue-green layer that protects it from further corrosion. It is used for cable, wire and electrical products, pipes for plumbing, heating and ventilation, as well as building wire and sheet metal facing. Copper is also used in integrated circuits, computer chips, and printed circuit boards. Copper wire runs throughout electrical devices like sports scoreboards and electrical vehicles.

Copper is essential for the normal healthy growth and reproduction of all higher plants and animals. It helps iron-rich foods make red hemoglobin in the blood.

Tin (Sn)

Top Producers:
China, Indonesia, Peru, Bolivia

Tin, derived from the mineral cassiterite, is easily shaped and corrosion resistant. Named for the Etruscan god Tinia, it is one of the earliest metals known. The silvery-white metal was recognized for its hardening effect on copper and used to make bronze implements as early as 3500 B.C. It is used in coatings for steel containers, in solders for joining pipes or electrical/electronic circuits, in bearing alloys, in glass-making, and in a wide range of chemical applications.

Tin is used to produce window and automobile glass. In the Pilkington process, molten glass is poured on a bath of molten tin, where it spreads out and forms a level surface.

KEEPING SCORE

Considered a symbol of Canadian culture, hockey games draw huge crowds to arenas such as General Motors Place, in Vancouver, B.C., host to the 2010 Olympic hockey finals. In 2006, GM Place installed a new \$5,000,000 Daktronics ProStar LED scoreboard. Measuring 4.1 m by 7.3 m and weighing over 22,000 kg, the scoreboard incorporates four of the largest video displays in the NHL. Their size, combined with their 10 mm pixel spacing, gives the displays an image that is unrivaled in any NHL arena. Video displays typically use red, blue, and green light-emitting diodes (LEDs), which combine to form one pixel of a video image.

Gold (Au)

Top Producers:
China, South Africa, U.S., Australia

Gold, a rare element, is the most easily shaped metal known, conducts heat and electricity, and will not tarnish, rust, or corrode. Widely distributed in the Earth's crust in low concentrations, gold is often produced as a by-product of mining for other metals. Used primarily for coins, jewellery, and other ornamentation, gold is also used in electronics, medical devices, and to plate some skate blades. It can also be found in electrical connections, printed wiring boards, and sensors for ignition systems, such as those in ice resurfacing machines.

Gold glazing on windows helps keep buildings warm in the winter and cool in the summer.

Silver (Ag)

Top Producers:
Peru, Mexico, China, Chile

Silver occurs in the Earth as a pure free metal and has been in use since ancient times. Soft, white, and lustrous, it is strong, easily shaped, and highly reflective. It easily conducts heat and electricity, can withstand temperature extremes, and acts as a disinfectant. Traditional uses of silver include coins and medals, industrial applications, jewellery and silverware, as well as photography. Silver is also used in batteries, brazing and soldering, catalytic converters in vehicles, electronics and circuit boards, electroplating, hardening bearings, inks, mirrors, and solar cells.

Silver kills germs, making it useful for such things as antiseptic bandages, bacteria-reducing cellphone covers, odour minimizing clothing, and water purification.



Coal

Top Producers:
China, U.S., Australia, India, South Africa, Russia

Coal, primarily made from carbon (C), is formed from layers of organic material that accumulated first as peat, then changed, or metamorphosed—through heat and pressure—into its present form. Different types of coal—some softer, some harder—come from different phases of the metamorphosis process. All types are used for power generation. Coking coal, produced from harder bituminous coal, is the key alloy in carbon steel. Added in varying amounts, coal produces steels of different hardnesses and workability. According to the resulting properties, carbon steel can be seen in everything from wrought iron work to structural applications, such as buildings and bridges, sheeting for ships and cars, as well as dies and cutting tools.

Thousands of different products have coal or coal by-products as components, including soap, aspirins, solvents, dyes, as well as plastics and fibres, such as rayon and nylon.

Aggregates

Produced widely around the world

Crushed stone, sand, and gravel are among the most abundant natural resources and, because of their weight, are usually extracted close to where they will be used. These basic raw materials are used by construction, agriculture, and industries employing complex chemical and metallurgical processes. Dolostone and granite commonly appear in aggregate mixtures. Aggregates are used to form the base for highways, roads, and sidewalks, as well as to build sewers and water mains, and to manufacture concrete and asphalt mixes.

The Richmond Oval, host to the 2010 Winter Olympic Speed Skating competition, was built using 1,100,000 cubic feet of concrete, a mixture that commonly includes cement, coarse and fine aggregates, and water.

Gallium (Ga)

Top Producers:
China, Germany, Kazakhstan, Ukraine

Gallium, occurring in the Earth's crust at approximately 16.9 parts per million, exists as a trace component in the rock bauxite and the mineral sphalerite. It is extracted as a by-product of aluminum and zinc production and has a brilliant silvery colour in its pure metallic form. Most gallium goes into gallium arsenide, a compound of gallium and arsenic, which is an important semiconductor used to make devices like infrared light-emitting diodes (LEDs), laser diodes, and solar cells.

Solid gallium will melt in the human hand. It becomes liquid when near room temperature and can be used for high temperature thermometers.

Gypsum (CaSO₄·2H₂O)

Top Producers:
China, U.S., Iran, Spain, Canada

Gypsum, a common sedimentary mineral, often occurs in massive beds, usually from precipitation out of highly saline waters. It ranges from colourless, white, or grey to shades of red, brown, and yellow. It can be known as selenite, satin spar, and alabaster, depending on the type of formation. Gypsum is very soft, measuring 2 on the Mohs scale of hardness, meaning it can be scratched by a fingernail. It is a natural insulator, making it ideal for building plasters and wallboard products, such as drywall. Gypsum also goes into caulking, paint, and Portland cement, one of the key ingredients in concrete.

Using coloured chalk on a blackboard means you are holding calcium sulphate, a form of gypsum, in your hand.

Limestone (CaCO₃)

Top Producers:
China, U.S., Russia, Japan, Germany

Limestone is a common whitish-grey sedimentary rock composed primarily of the mineral calcite. The calcite is formed mostly from the remains of corals and marine organism shells which accumulated in sea beds. Limestone is a key building material, either cut into building blocks or crushed to go into cement, one of the most important construction materials in use. Limestone is also essential to glass-making, including windows, bottles, windshields, and fiberglass insulation.



The Great Pyramid of Giza, one of the Seven Wonders of the Ancient World, is made entirely from limestone.

CLEANING UP

As much part of skating itself is the use of an ice resurfacing machine. Kids and adults are fascinated by the transformation of a scratched sheet of ice into a gleaming mirror-like finish. Frank Zamboni invented the first self-propelled ice resurfacing machine in 1949 in Paramount, California. In 1967, his company launched a second facility, in Brantford, Ontario. Sixty years after the creation of the first machine, over 9,000 units have been produced.

How does the Zamboni® ice resurfacing machine work? First, a sharp steel blade, 1.3 cm thick and weighing 25.9 kg, shaves a thin layer from the surface of the ice. Then, augers collect the shavings and transport them to a snow tank. The ice surface gets cleaned by the machine's "conditioner" using wash water, then resurfaced with clean water spread by a cloth towel.

Built with a steel tube chassis, steel blades and augers, an electric or fuel-powered engine, and lead-acid batteries, the Zamboni ice resurfacing machine uses many metals and minerals throughout its construction.

BUILDING DREAMS

The first artificial ice rink, the Glaciarium, was built in 1876 in London, England. Today, state-of-the-art, ecologically friendly building technology and design appears in the Richmond Oval, the 2010 Winter Olympics Speed Skating venue in Richmond, near Vancouver, B.C. The Richmond Oval offers space for two international-sized hockey rinks, or eight full-sized tennis courts, when the Speed Skating track is not in use. The venue was built to seat 8,000 people at the 2010 Winter Olympics.

Describing the building of the Oval, the venue's Web site lists some impressive statistics. To prepare the construction site, the builders used 170,000 cubic metres of sand; the building features a 6.5-acre roof made from mountain pine beetle affected lumber; it incorporates 5,600,000 kg of steel rebar; and it is supported by 2,200 stone columns.



Lead (Pb)

Top Producers:
China, Australia, U.S., Peru

Lead, a metal found in the mineral galena, is heavy, easily shaped, and very resistant to common corrosion problems. The primary use of lead today is in the lead-acid storage battery, a vital power source in both fuel and electric powered vehicles.

Lead can be recycled infinitely without loss of its qualities. Lead-acid batteries, with a 97 per cent recycling rate, are recycled more than any other consumer product.

Zinc (Zn)

Top Producers:
China, Australia, Peru, U.S., Canada

Zinc, the fourth most common metal in use, comes from zinc ores such as the minerals sphalerite and smithsonite, and usually occurs with copper or lead. More than half of the zinc consumed is used for galvanizing, a process in which a thin layer of zinc is applied to iron and steel products to prevent rusting. Such products are extensively used in vehicle, bridge, and building construction. Zinc sulphide is used in making luminous dials, X-ray and television screens, paints, and fluorescent lights.

Humans, animals, plants, and even the smallest microorganisms need zinc to function. It is vital for taste and smell, as well as skin cell renewal, and helps keep our hair and nails healthy.

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