5 **Keeping It Safe**
Compromising hose assembly installation can result in disaster

22 **Beautiful Banff**
A breathtaking and majestic place to visit

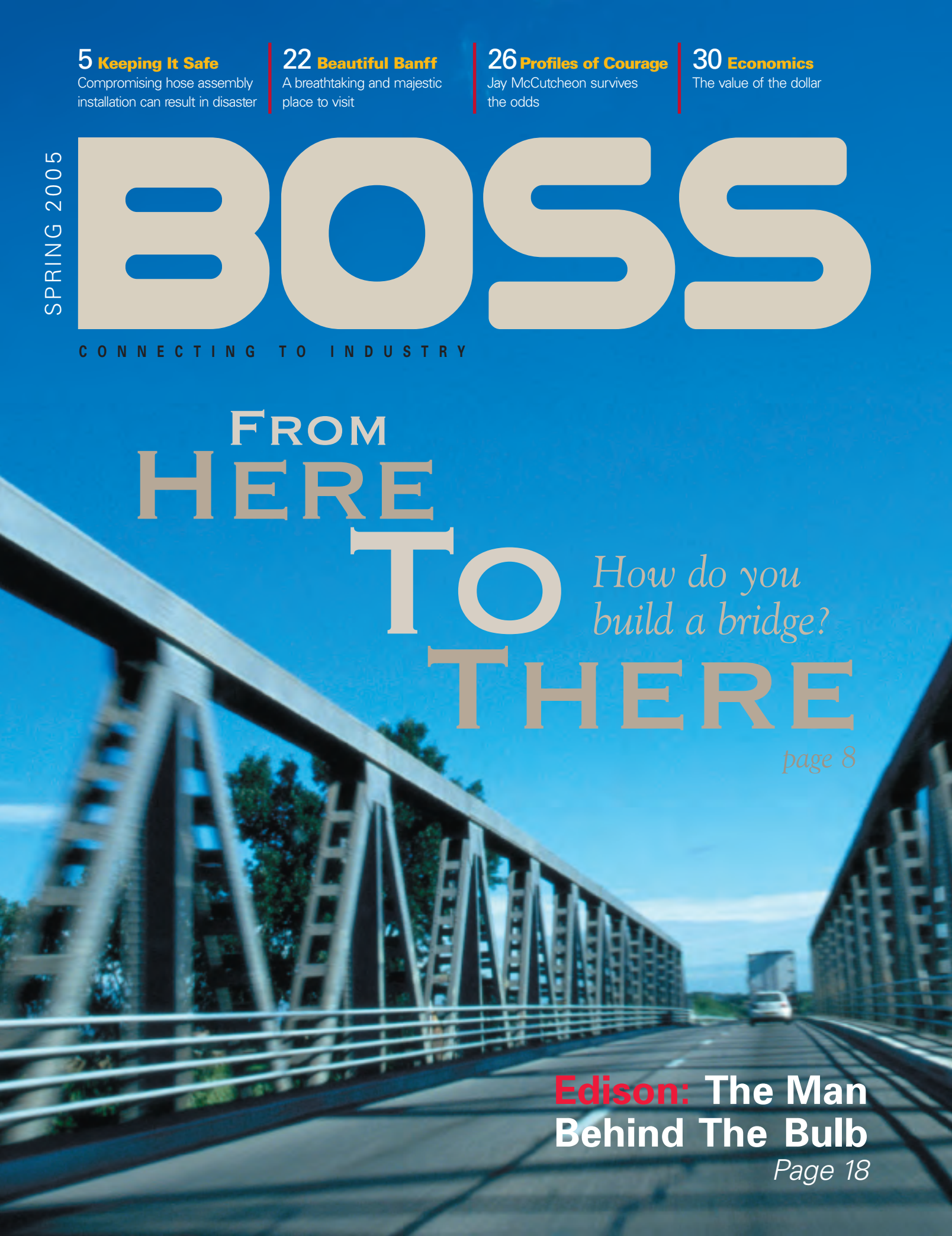
26 **Profiles of Courage**
Jay McCutcheon survives the odds

30 **Economics**
The value of the dollar

SPRING 2005

# BOSS

CONNECTING TO INDUSTRY



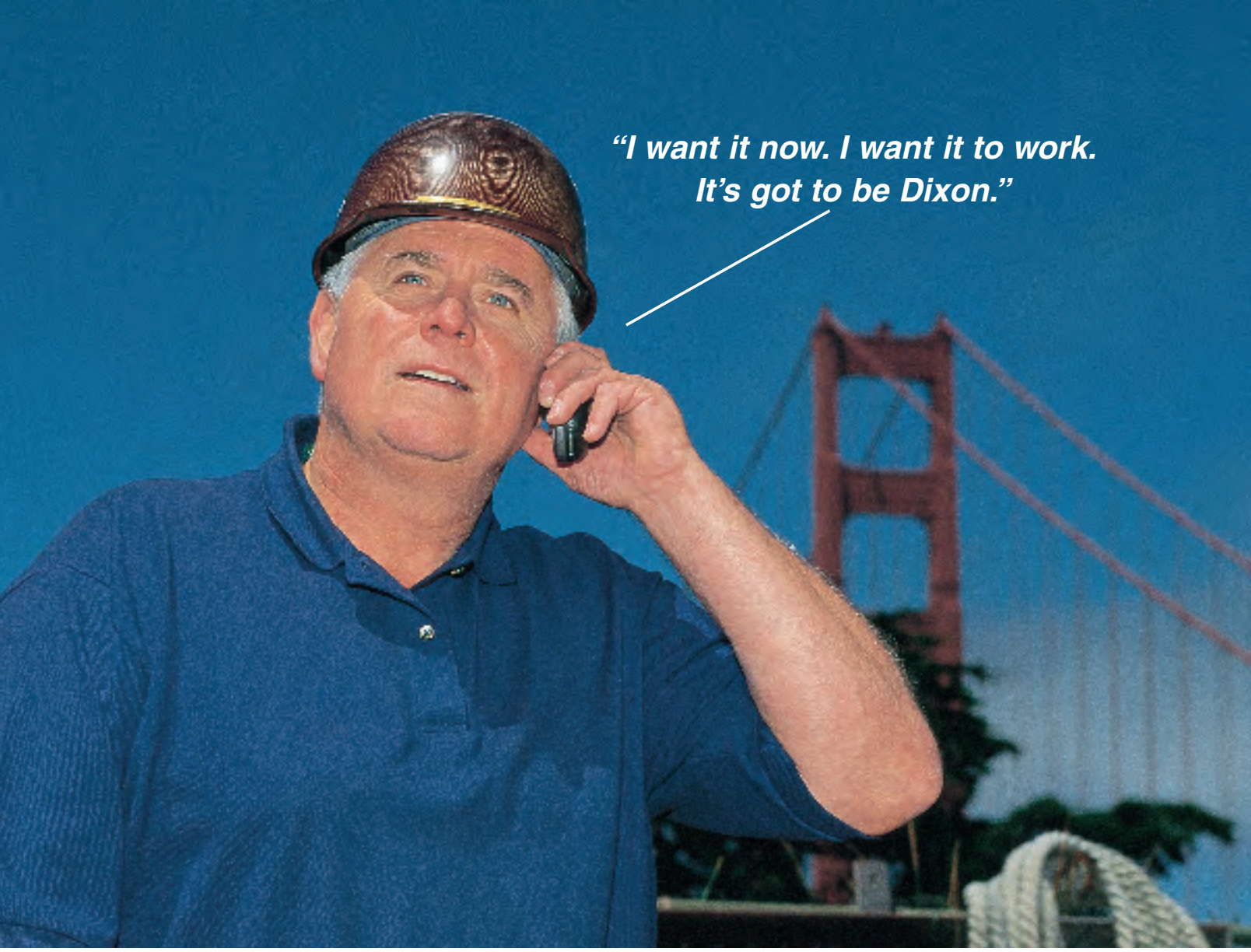
## From Here To There

*How do you build a bridge?*

page 8

## Edison: The Man Behind The Bulb

Page 18

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## departments


5 **KEEPING IT SAFE**
Proper hose assemblies keep workers safe

7 **GADGETS**
New products

14 **FACTS & FIGURES**
Bridge facts

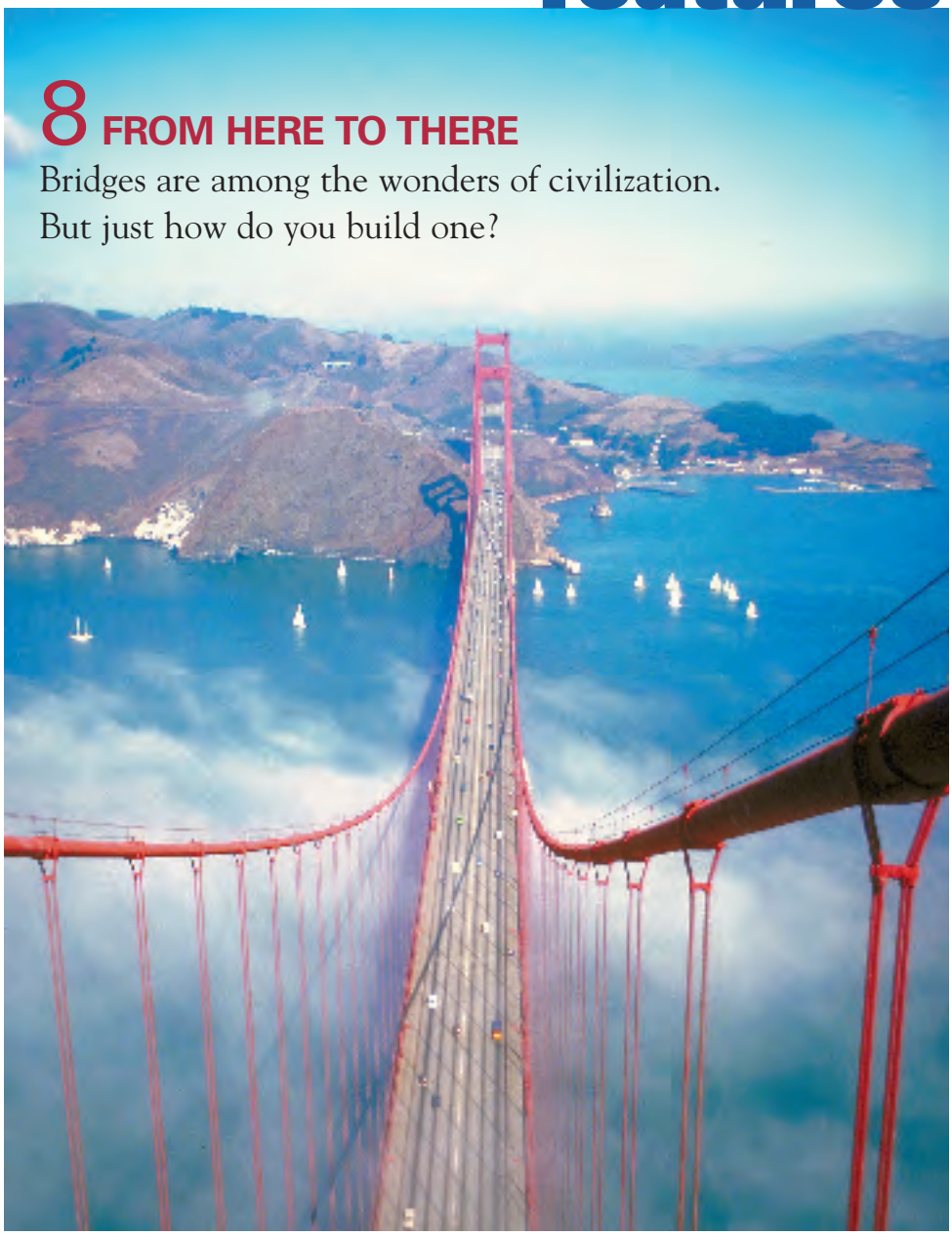
15 **LEADERSHIP**
The essence of sportsmanship

26 **PROFILES OF COURAGE**
Jay McCutcheon tells what it means to be a true survivor

28 **HEALTH & FITNESS**
Exercises to stay healthy

30 **ECONOMICS**
The value of the dollar


# features




## 8 FROM HERE TO THERE
Bridges are among the wonders of civilization. But just how do you build one?



## 18 THE MAN BEHIND THE BULB


Edison was a remarkable, creative man who was more than just the inventor of the light bulb.


## 22 BEAUTIFUL BANFF
Known as the grand masterpiece of the West, Banff offers a unique traveling adventure.

# The Right Connection

**Welcome to the inaugural issue of BOSS magazine.**

Since 1916, Dixon has tried to provide our distributors and end users with quality products and superior service. Since hose and fittings are used in every industry, our products have ended up wherever work was being done.

The many changes in technology and equipment over the years has forced us to continually look at ways to make our product offering and our company the best choice for our customers. It has always been our goal to accomplish this with honesty and integrity.

This year, we have decided to publish a quarterly magazine. In the magazine will be articles that relate to industry that we hope you will find interesting and informative and illustrate the value of hard work and persistence.

Our reward will be informed readers/customers that continue to see value in using our company's products. We hope you enjoy reading the first edition of *BOSS* and we welcome your comments or suggestions for articles you might find interesting at **bossmagazine@dixonvalve.com**.

R.L. Goodall
CEO, Dixon Valve & Coupling Company


**BOSS**
SPRING 2005

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# Selecting Proper Hoses and Couplings

*When the right materials are not selected or installed properly, the results can be catastrophic.*

Air is used as an energy source in almost every type of industry. It is an extremely efficient form of energy and is relatively inexpensive. It is easy to regulate and, when used with the proper equipment, is easy to clean and can be delivered relatively free of moisture if necessary. Air, as it exists all around us, is at atmospheric pressure or 14.7 pounds per square inch. When it is used as an energy source, it is compressed and delivered through a piping system or air hose to a tool or other piece of equipment at pressures many times higher than atmospheric. When the air is released at the tool and returns to atmospheric pressure, it does so with explosive force. We could call that a controlled explosion because it is that energy that triggers the

*continued on next page*

tool or other piece of equipment to perform the job it was intended for. Air hose and air hose fittings are designed to deliver that force with a high degree of reliability and, when properly selected and applied, do just that. Mistakes can occur, however, when the wrong hose or fitting is pressed into service because the right one isn't available or when the proper one is not maintained over time. Failure to follow correct procedures and poor maintenance can result in serious accidents and property damage. An example of what can go wrong occurred at a coke processing plant at a steel mill some years ago.

## Case Study

Coke making is a common process that involves carbonization of coal to high temperatures (1100°C) in an oxygen-deficient atmosphere in order to concentrate the carbon. The coke is then used to make steel or iron. Coke making was common practice for one processing plant here in the United States. This plant had been operating since 1920 and even had the original electrical system from when the plant was first built.

The processing plant had two sets of air systems: one ran the instruments and another ran the plant. While the lines can be parallel, the air flow for the instruments is critical and needs to be constant. If the instruments do not work, the system goes into a "fail-safe" mode, which eventually leads to a process shutdown venting toxic and volatile gases to the atmosphere to prevent an explosion. The gases produced during the manufacture of coke need to be cleaned before they can be safely disposed of. This is done in what is called a bag house, similar to a gigantic vacuum cleaner. Because the plant electrical system was so old, the circuits needed to be closed in specific sequence and within a specific period of time between each circuit.

In 1992, on a damp, Sunday night, things went wrong. During the startup of the bag house, something did not happen properly and the electricity blew out, putting the plant and part of the city in a blackout. Without current, the air systems failed, causing the fail-safe shutdown mode to begin. In an attempt to keep the system up and running, a small portable compressor was attached to the instrument air system. This compressor, however, could not supply enough air to the instrument air side of the parallel air and piping system. When closely examined, a directional control valve was not installed properly, so the instrument system shut down, the vents opened up, and gas was released.

Two larger portable compressors were required to get the plant air system running again. These compressors were brought online but the portable compressor connection (header) located on the outside of the building was blocked by a construction trailer. Each compressor had its own length of hose and required accessories to connect to the header. With the construction trailer blocking the header, neither hose was long enough to reach from the compressor to the header. Both lengths of hose were connected to each other and then to the header, so that only one compressor was now working. Desperate to connect the second compressor to the header, a worker picked up a hose that was long enough to reach from the second compressor to the header, but was never intended to be used for this application. While the lay line on the hose rated it to work at 150 psi, neither the hose or fittings were recommended for use with compressed air. With that hose installed, the system was up and running. The plant moved into recovery mode.

The compressors were running successfully and two plant workers decided to check the fuel level on the compressors to be sure they didn't run out of diesel fuel. As one worker was adding more fuel to the compressor with the incorrect connecting hose, another worker went around the compressor to check on its operating condition. At this point the improvised connection on the compressor came undone. The hose blew off and the blast of air hit him in the head, knocking him a distance of 25 feet. While the estimated weight of the ball of air that was ejected from the compressor was only 16 pounds, the estimated velocity of the air was 771 mph. There was a sonic boom, and a number of homes close by had their windows shattered.

The worker that was struck suffered severe physical damages and never fully recovered. Had the right combination of hose and fittings been used in this situation, this accident would never have happened.

It is extremely important that hose assemblies should be viewed as potential hazards. The proper selection and maintenance of hose, couplings, attachment devices and accessories are imperative.

It is the end users' responsibility to identify to the distributor the application and any special conditions that the hose assembly must meet. It is the distributor's responsibility to supply the proper assembly for the intended application. Accidents and down time may occur if hose assemblies are not properly selected for the specific application. The performance and safety of the assembly is achieved by the quality of the individual components.

# GADGETS

By Karen Baxter

PHOTO COURTESY OF RADIO SHACK

## AMBIENT WIRELESS WEATHER FORECASTER

Conveniently check out the day's weather forecast and plan your outdoor activities without turning on a computer, radio or television. Ambient Devices' Wireless Weather Forecaster, sold by Radio Shack, is a portable four-inch glass display that provides five-day, zip-code specific weather forecast information in an easy-to-read format.

The forecaster, which operates 24/7, is powered by batteries or an AC adapter, and requires no computer connection, phone lines or additional cords. The device receives weather data via a nationwide wireless network.

No subscription fee is required for local forecasts. However, for $6.95 a month, you can upgrade your service to customize the information you receive and add forecast conditions for other cities.

**Ambient Devices, $99. radioshack.com.**

## PIONEER HTZ-645DV WIRELESS HOME THEATER

You've got the big-screen TV, but your living room still doesn't have that movie theater feel you wanted. It's probably the sound system you're lacking. Now, setting up a home theater with surround sound is easy with Pioneer's HTD-645DV Wireless Home Theater.

No messy, complicated wires. Simply set up the front speakers as normal, using the color-coded wires, and the rear surround is created through a single wireless speaker that sits at the back of the room. A WiFi transponder sends information to the wireless speaker at the back of the room, encompassing the listening area with high quality audio for either surround sound or two-channel stereo.

The HTD-645DV includes 650 watts of power, a five-disc DVD changer with DVD-Audio and Super Audio CD (SACD) playback, as well as progressive scan circuitry for exceptional quality DVD-video images. The three speakers are sized to fit a bookshelf.

**Pioneer Electronics, $700. pioneerelectronics.com.**

PHOTO COURTESY OF PIONEER ELECTRONICS

# From Here To There

*Bridges are among the wonders of civilization. But just how do you build one?*

In the Chinese city of Zhao Xian, some 40 miles south of Beijing, a bridge called the An Ji curves up from one shore of the Xiache River and down again to reach the opposite shore. One hundred-sixty-four-feet long and 33-feet wide, the bridge, whose name means "safe crossing," has been carrying traffic along its arched back for almost 1,400 years.

The An Ji is not the oldest arched bridge in the world–the Romans were covering Europe with them hundreds of years earlier–but it is the oldest with its particular sweeping design, predating anything like it in the West by some 700 years.

For the question, "How do we get from here to there?" the bridge has often been the answer. Not every river can be crossed with ease by foot or ferry. Wind and weather can make a river's waters tempestuous. A bridge allows people, animals and goods to cross without concern for Mother Nature's roadblocks. Bridges ease isolation and encourage trade. Like the An Ji, they help assure a safe crossing.

But how do you build a bridge? What factors do you have to keep in mind if you want to span a creek, a river or even a bay?

The earliest bridges were probably split logs in a riverbed or vines that grew from shore to shore. These bridges have simple spans. A span is the distance a bridge travels without support. More complex are the so-called clapper bridges that survive in southwest England. Stone slabs balanced on regularly spaced rocks in the river may date back to the Stone Age.

But this is the stuff of children's building blocks. How are longer, more complex and more ornate bridges built?

*By David Holzel*

## How Bridges Stay Up

Consider the beam bridge. We see them everywhere in the form of concrete overpasses, with short spans supported by vertical posts and multiple spans supported by piers. But in its simplest form, a beam bridge is merely a long, rigid piece of wood or other material (the beam) laid horizontally.

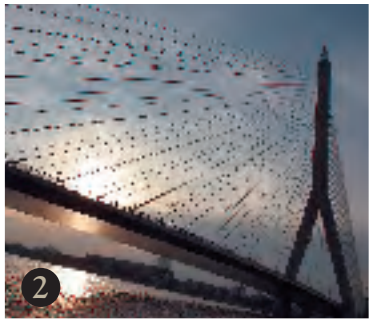
A thick piece of wood over a creek may stand up to a few people crossing at one time. But keep adding weight to the bridge and it may begin to sag, then buckle and eventually snap. Making sure this doesn't happen requires accounting for the two forces that act on a bridge:

- **Compression**–the bending of the beam under a load
- **Tension**–the stretching of the bottom of a beam under a load

Too much compression and a bridge will buckle. Too much tension and it will snap.

Engineers handle these forces in one of two ways:

- **Dissipate**, or spread, the forces over a greater area, or
- **Transfer** the forces from an area of weakness to an area of strength.





**THE DIFFERENT KINDS OF BRIDGE CONSTRUCTION**
CLOCKWISE FROM UPPER LEFT: TRUSS, CABLE-STAYED, CANTILEVER, ARCH, AND SUSPENSION.

## What Are the Different Kinds of Bridge Construction?

**Arch bridges (4)**– The engineer who built the An Ji bridge knew that an arch will dissipate the weight of a bridge, distributing the forces of compression and tension along the curve of the bridge's mouth and down to the ground.

The design allows small stones to be used in construction, the easier to haul and build with. In addition, the greater load placed on the arch forces the pieces together, making a virtue out of compression and making the bridge stronger. The arch bridge was the dominant design until iron was introduced in the 18th century.

**Truss bridges (1)**– Arch bridges harness the power of the triangle. So do truss bridges, which distribute their weight through a large beam fitted with connected triangles or A-shaped frames. Railroad companies constructed long wooden truss bridges in the 19th century to carry trains through the American West.

**Cantilever bridges (3)** are like two arms reaching out to each other from opposite shores—without touching. Each arm, or beam, is balanced on a pier. An abutment at the shore end of each beam holds the beam in place. A small section, called a key, connects the two outstretched arms.

To extend the length of a bridge, a suspended span is built between the two arms.

**Suspension bridges (5)** have a deck suspended by cables. The design allows them to be the longest bridges in the world. In addition to the deck, which carries traffic, suspension bridges have three other parts: towers, also called pylons; cables, the long arching connections between the towers; and the hangers, or suspenders, which connect the cables vertically to the deck. The ends of the cables are secured with anchors on each bank.

The suspension bridge is an example of transferring the forces of compression and tension from an area of weakness to an area of strength. Traffic on the deck pulls down on the cables, causing the cables to pull down and sideways on the towers. The anchors, held in place by concrete, keep the towers from falling.

**Cable-stayed bridges (2)** are a variation of suspension bridges. Instead of being supported by cables attached to two massive towers, each section of a cable-stayed bridge is supported by its own cables attached to a tower. The weight on the deck of the bridge pulls on the cables. The pull is then transferred to the towers, which carry the weight to the ground.

## Famous (and Infamous) Bridges

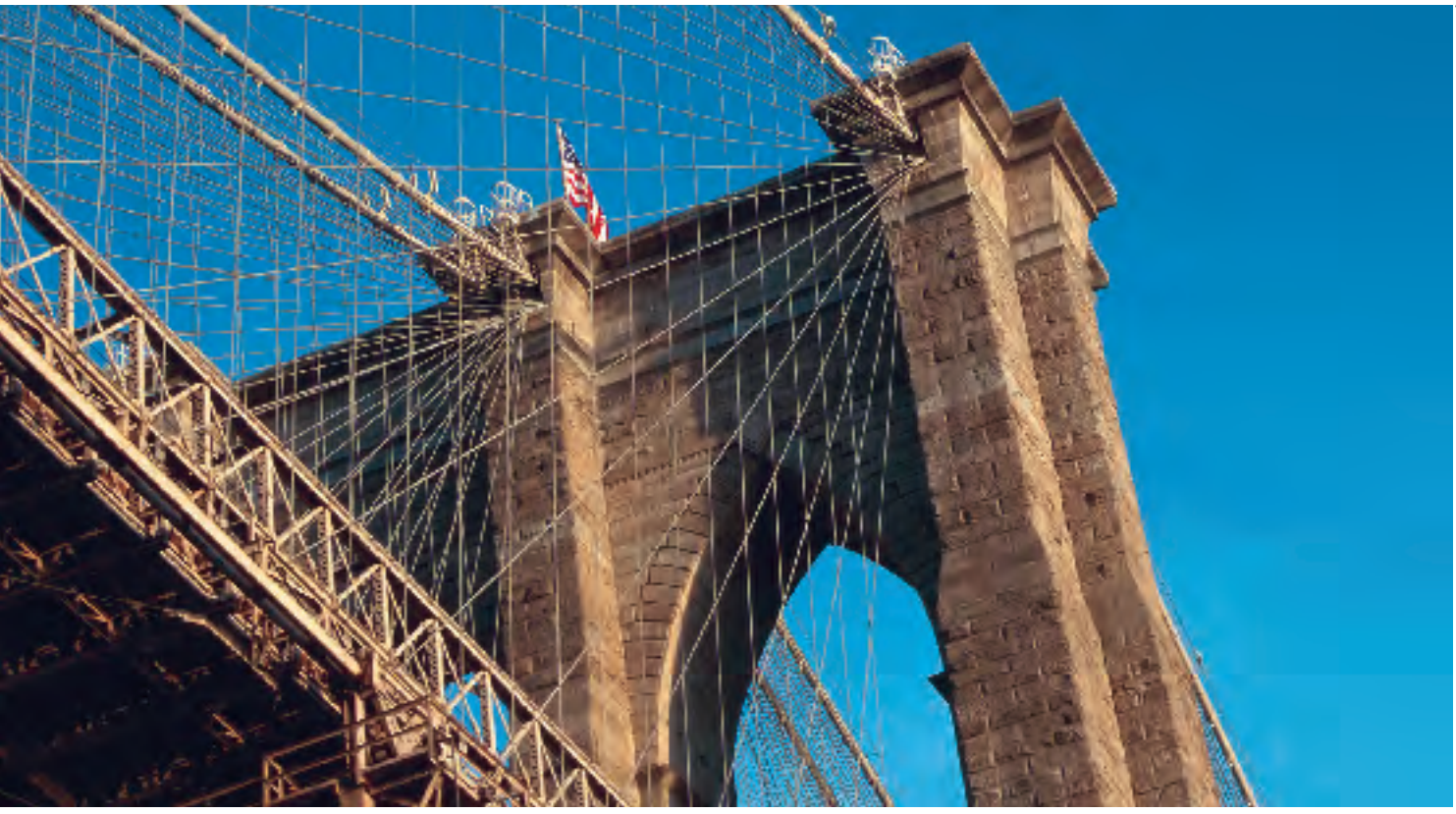
**The Eads Bridge** over the Mississippi at St. Louis – When it opened in 1874, after seven years of construction, St. Louis residents paid a nickel apiece for the novelty of walking across the Mississippi River.

City business interests saw a bridge as key to compete economically with Chicago to the north. But riverboat companies opposed a bridge, fearing it would hurt their business. The final design was a steel-arch bridge with three spans of more than 500 feet each, which would allow the passage of ships up and down the river.

Construction of the abutments on the east and west banks and the two piers in the river was difficult in the Mississippi's muddy ground. Engineer James Buchanan Eads decided to use a new technology he had seen in France to dig the piers: pneumatic caissons, chambers that allow workers to dig underwater. Water is kept out of the caisson by high-pressure air being pumped in. Eads developed a pump to remove the sand and mud that kept filling the chambers.

The reaction to the bridge was summed up by poet Walt Whitman, who wrote in 1879, "I have haunted the river

**THE BROOKLYN BRIDGE** WAS THE FIRST SUSPENSION BRIDGE TO USE STEEL CABLES. SUSPENSION BRIDGE DESIGN ALLOWS THESE BRIDGES TO BE THE LONGEST IN THE WORLD.



every night lately, where I could get a look at the bridge by moonlight. It is indeed a structure of perfection and beauty unsurpassable, and I never tire of it."

**The Brooklyn Bridge** – The same economic ambitions that drove the St. Louis bridge contributed to building its near contemporary, the Brooklyn Bridge. By 1850, the East River had become an impediment to "the growing trade and further advancement" of the competing cities of New York and Brooklyn, Deborah Cadbury writes in *Dreams of Iron and Steel.*

The Brooklyn Bridge, built between 1869 and 1883, was the first suspension bridge to use steel cables. The plan was audacious. Its central span was to be 1,590 feet long. Its cables were composed of nearly 1,250 miles of steel wire. Its gothic granite towers were 276 feet high. There was to be room for a walkway, railway lines and a road.

The engineering challenges were enormous. The towers were to stand on foundations that would reach bedrock, 40 feet below water level on the Brooklyn side and more than 70 feet below water level in the deeper water of the New York side.

The building of the Brooklyn Bridge has become part of America's can-do lore. The whole country was "in love with the sheer audacity of the enterprise," Cadbury writes. But there was a price paid. Twenty men lost their lives in its construction, the first being its engineer, Johann August Roebling. Roebling, who already had built bridges at Cincinnati and Niagara Falls, died of injuries he suffered while surveying the site.

His eldest son, Washington August Roebling, took over. He, too, fell victim to the bridge, developing "the bends" or "caisson disease" in 1872. Workers on the St. Louis bridge had noticed strange after-effects from working in the high-pressure caissons. The crippling, often fatal condition occurs when nitrogen in the body becomes gaseous and bubbles, damaging body tissue. As the digging of the Brooklyn Bridge's foundations went deeper, incidences of the bends became more common and more severe. Washington Roebling was so incapacitated that he was forced to watch the rest of the bridge's construction through binoculars from his Brooklyn home.

**GOLDEN GATE:** ONE OF THE WORLD'S MOST FAMOUS BRIDGES, THE GOLDEN GATE IS COLORED ORANGE, REMINISCENT OF THE GRAND CANYON.

**The Golden Gate Bridge** – Opened in 1937 after four years of construction, the Golden Gate connects San Francisco and Marin County to the north. Its central span is 1,650 feet long and its Art Deco steel towers are 750 feet high. Each of the bridge's cables weighs more than 7,000 tons.

Engineer Joseph P. Strauss described the Golden Gate's orange color as reminiscent of the Grand Canyon.

**Tacoma Narrows Bridge** — People weren't dismayed by the peculiar behavior the bridge over Puget Sound exhibited after it opened in July 1940. The world's third longest bridge pitched and tossed and quickly earned the nickname "Galloping Gertie."

That summer and into the fall, the bridge drew a record number of cars, their drivers enjoying the carnival-like ride. But when a gale hit that November, the bridge began to twist ominously from the center. It was cleared of traffic, and before long Galloping Gertie's center section collapsed into Puget Sound.

**AKASHI KAIKYO:** IN 1988, THE WORLD'S LONGEST SUSPENSION BRIDGE, THE AKASHI KAIKYO WAS DESIGNED TO WITHSTAND EARTHQUAKES AND WIND SPEEDS UP TO 180 MPH.

## Longer and Longer

Several factors contributed to Galloping Gertie's demise. One is that it lacked a stiffening truss, a beam harnessing the power of the triangle to handle the forces of tension and compression. Another factor is that the builders had failed to take into consideration the power of wind.

With these lessons learned, longer and longer bridges began to rise all over the world.

In 1988, the world's longest, tallest and most expensive suspension bridge opened in Japan, after 10 years of construction. The Akashi Kaikyo Bridge stretches 12,828 feet to connect the city of Kobe with Awaji-shima Island. The suspension bridge's longest span, its central one, is 6,530 feet. Its two towers rise 928 feet, just 60 feet shorter than the Eiffel Tower.

During construction, the Akashi Kaikyo was in a race with Denmark's East Bridge to become the world's longest. In 1995, it appeared the Japanese bridge might lose the contest when an earthquake measuring 7.2 on the Richter scale hit the country. The earthquake was serious enough to take 5,000 lives. But the bridge, designed to withstand much stronger quakes, as well as winds of up to 180 mph, was undamaged.

In another six years, the Akashi Kaikyo may lose its title as the world's longest suspension bridge to one connecting Italy and Sicily. Construction of the Messina Strait Bridge is expected to begin this year. When completed in 2011, its central span will be two miles long, and the entire bridge will weigh nearly 300,000 tons.

Such bridges are among the wonders of civilization. Yet they all must abide by the same forces of nature, whether the most complex suspension bridge on the planet or a beam that children have placed over a brook.

*David Holzel is a freelance writer in Montgomery Village, Maryland.*

PHOTO COURTESY OF GETTY IMAGES

# A Ride In the Clouds

The photographs are dreamlike: The bridge, its cable-stayed concrete pillars rising like masts, sailing through the clouds over France's southern Tarn River valley. The Millau Viaduct, which opened in December to much fanfare, was built in just three years to ease traffic bottlenecks between Paris and the Cote d'Azur. The Millau Viaduct is both the heaviest and tallest bridge in the world.

## Bridge Facts

**Type:**
Cable-stayed Bridge

**Length:**
1.6 miles

**Width of the deck:**
105.2 feet, carrying two lanes of traffic in each direction

**Thickness of the deck:**
13.8 feet

**Weight of bridge:**
266,759 tons

**Materials Used:**
39,683 tons of steel
227,076 tons of concrete

**Number of stays:**
154

**Built to withstand:**
Winds up to 155 mph

**Number of construction workers:**
500+

**Expected time to cross by car:**
1 minute

**Cost:**
$523 million

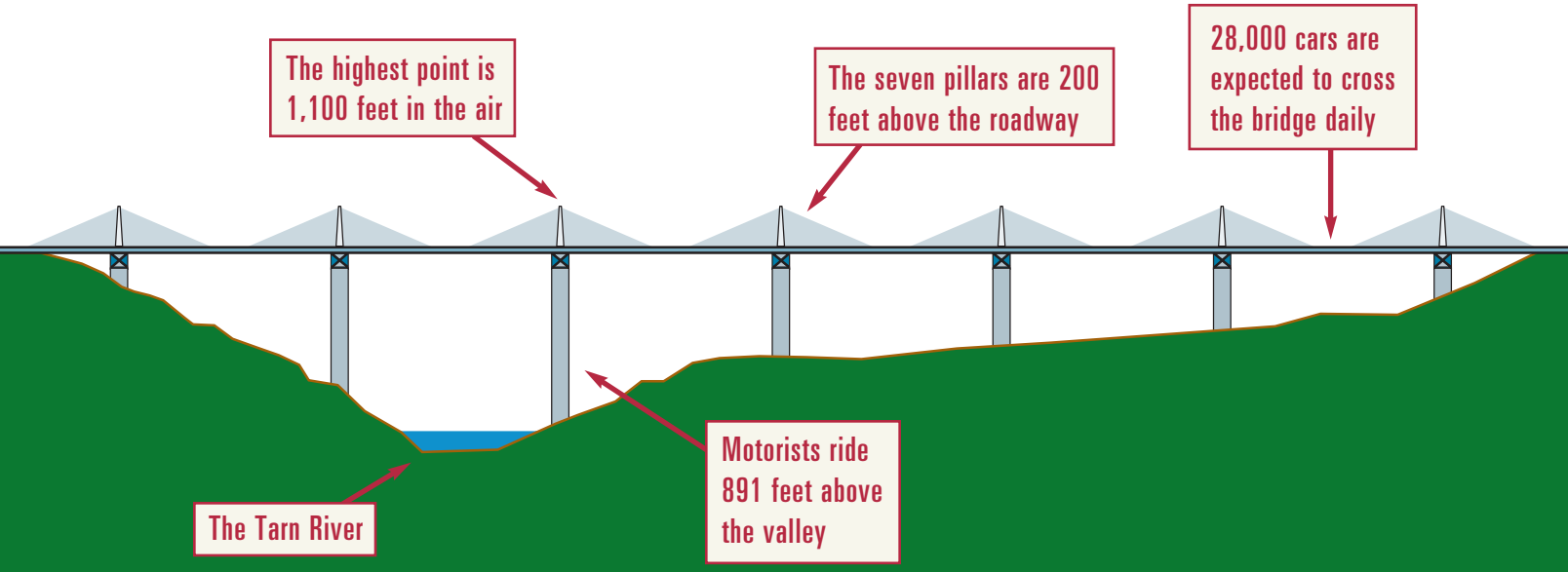



ILLUSTRATION BY JASON QUICK

# The Essence of Sportsmanship

BY MICHAEL JOSEPHSON

PHOTO COURTESY OF STAFF/AFP/GETTY

**Eugenio Monti**

In 1964, an Italian named Eugenio Monti was the world champion in bobsledding and a strong favorite in the Winter Olympics. His nation expected a gold medal and after his last run it looked as if he might get it. The British team, led by Tony Nash, still had a chance to beat him, but Nash discovered a faulty axle that would require his team to withdraw. Instead, Monti removed a critical bolt from his sled and offered it to Nash.

As if to prove that no good deed goes unpunished, Nash won the gold medal and Monti was viciously criticized in the Italian press. Yet he was unshaken. "Nash didn't win because I gave him the bolt," he reportedly said. "He won because he had the fastest run."

Every real competitor wants to win, but Olympic medalist John Naber says a true sportsman, one who believes in the Olympic ideal, wants to win against his best opponent on his best day. The sportsman is not elated but disappointed when top competitors are injured or disqualified.

Monti won the gold medal at the next Winter Olympics, but it was his willingness to lose that earned him a prominent place in Olympic history. His act represents sportsmanship at its best: the pursuit of victory with zeal and passion, recognizing that there is no true victory without honor.

Today, with so many athletes willing to cheat or behave badly just to win, we need reminders of the noble potential of sports. And parents and coaches should be teaching youngsters that the real glory of sport is in the striving, not the winning.

*Reprinted from* The Best is Yet to Come *with permission of the Josephson Institute of Ethics. www.josephsoninstitute.org*

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Manufacture and distribute hose fittings and accessories used in industrial, construction and mining applications. Since 1916 these products have been used for the transfer of air, water, steam, hydraulic, petroleum, chemical and food products.

## American Coupling Company

ph# 630-323-4442 fax# 630-323-4120

Manufacture and distribute pneumatic and low pressure Brass hose fittings, couplings and adapters. American Couplings has served the industrial distribution market since 1929 with a broad selection of high quality machined Brass hose products.

## Bradford Company, Inc.

ph# 800-789-1718 fax# 800-789-4046

Manufacture sanitary fittings, clamps, valves and hangers used in the food, beverage, pharmaceutical and industrial markets. Bradford specializes in weld fittings, clamp fittings, I-line tube fittings and bevel seat configurations in a variety of sizes from 1/2" to 12". The products are available in 304 and 316L Stainless Steel material and meet or exceed the 3A standards.

## Dixon - Bayco, Ltd.

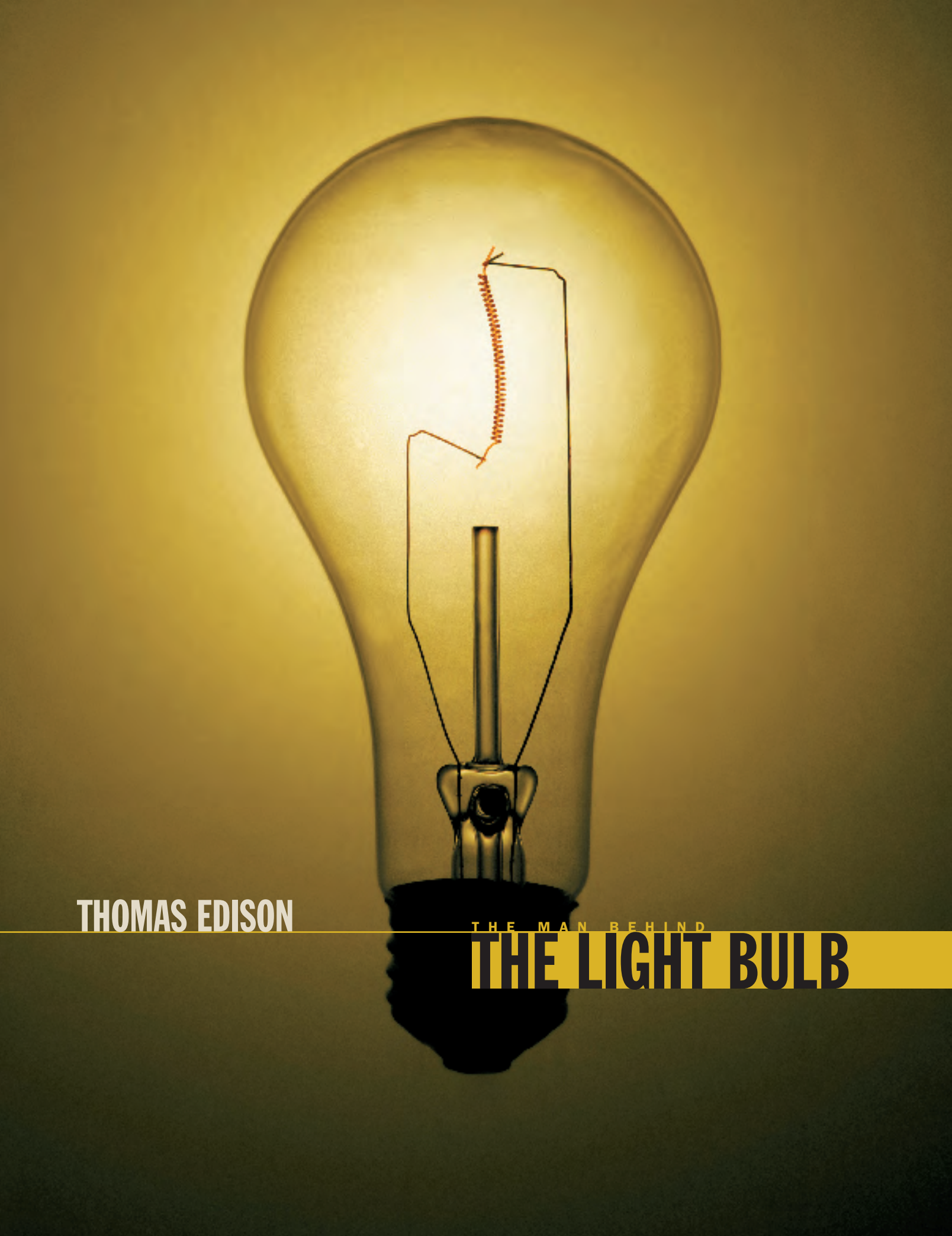
ph# 705-436-1125 fax# 705-436-6251 (Ontario, CANADA)

Manufacture and distribute a complete range of Dixon hose fittings and accessories in Canada. In addition, they manufacture petroleum and dry bulk fittings and accessories used on tankers and for transferring liquids and dry materials from tankers to above and below ground storage facilities.

## Perfecting Coupling Company

ph# 704-334-9175 fax# 704-334-9002

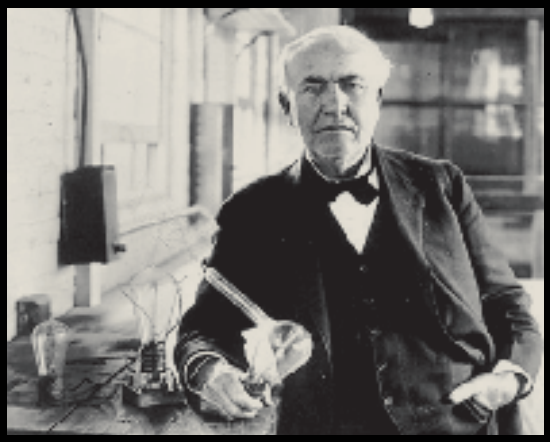
Manufacture and distribute a broad range of hydraulic and pneumatic quick disconnect couplings. Generally serving the market for coupling sizes of 2" or below. These products are used in a variety of applications including industrial, military, mobile, aerospace and the medical markets.


THOMAS EDISON
THE MAN BEHIND
THE LIGHT BULB

## It is late on a winter's night in 1876.

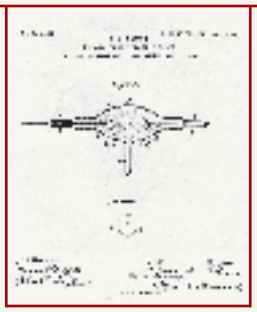
There is snow on the ground, and wood smoke curls from two brick chimneys. Inside, up the dark, uncarpeted stairs, a big bare-boarded room lit by gas jets and kerosene lamps stretches the building's full 100 feet. Its ceiling is laced with wire and piping, its walls lined floor to roof with jars of liquids and bottles of powder of every color. A rack in the center of the room is stacked with galvanic batteries, and every other nook and surface is covered with bits of copper, brass, lead, and tinfoil; crucibles, phials, and small darkened panes of glass; microscopes, spectrometers, telegraph keys, and galvanometers; rubber tubing and wax and small disks of some obscure material. At scattered workbenches and heaped-up tables there are a dozen young men engrossed in what they are doing: A bearded pair observe a spark jumping from an electromagnet to a metal lever; another boils a smelly chemical; another has his ear to some kind of telephone receiver; another, chewing tobacco, bends his head to frown at the needle on an instrument. In the far corner, stretched out on the floor amid a score of open books, is a pale young man with a mop of brown hair and stains on his hands, entirely lost to this world because he is concentrating on making a new one.

This is Thomas Alva Edison at 31. If we stay long enough, we will see him uncoil his shabby 5 feet, 8 inches and, stooping slightly, move slowly



among the workbenches, cupping an ear to listen to observations on the night's work, reaching over to tweak an instrument, breaking out in laughter as one of the fellows makes a joke at his expense. His black frock coat and waistcoat are dusty, and a white silk handkerchief around his neck is tied in a careless knot over the stiff bosom of a white shirt rather the worse for wear, but what stands out is the extreme brightness of his eyes.

Thomas Edison was America's most productive inventor in the 19th century and remains so into the 21st. His 1,093 patents are by no means the proper measure of the man. To Edison, the patents were the easy part, before "the long, laborious trouble of working them out and producing apparatus which is commercial" —and then fighting off the pirates. Edison's greatness lies not in any single invention, not even in the whole array, but in what he did with his own and other men's cleverness.



The invention for which he is most remembered, the incandescent bulb, is emblematic. The technology was a marked advance over the work of other inventors, but the piercing vision—and it was Edison's alone—was how he would bring light and power to millions of homes and offices.

In the early 1870s, he recruited three men who would be crucial: Charles Batchelor, an English textile machinist; John Kruesi, a Swiss clockmaker; and Edward Johnson, a voluble railroad and telegraph engineer. His journal of February 1872 had more than 100 sketches; with the help of Batchelor and Krusei, he won 34 patents in that single year.

Scientist George Barker of the University of Pennsylvania had enthused about a system of lights the inventor Moses Farmer had installed at an Ansonia, Conn., foundry. They were arc lights, so called because the light was an arch of elongated sparks reaching between two carbon electrodes. Bright as searchlights, they had been familiar since the '60s in British and American lighthouses and a few places of public assembly but were too blinding (and hazardous) for domestic use.

## EPIPHANIES

Edison's intuition was to think small. Instead of sending current to create a leap of light between the electrodes of big arc lamps, useless for domestic lighting, why not send it along the wire and into a filament in a small incandescent lamp? Back at Menlo Park he worked euphorically through two nights. "I discovered the necessary secret, so simple that a bootblack might understand it," he wrote. Edison went public only a week after his visit to Ansonia. His spicy quotes got full play in the newspapers: He had not only found the way to create an incandescent bulb but would be able to light the "entire lower part of New York" with one engine and 15 or 20 dynamos: "I have it now! With a process I have just discovered, I can produce a thousand—aye, ten thousand (lamps) from one machine. Indeed, the number may be said to be infinite … with the same power you can run an elevator, a sewing machine, or any other mechanical contrivance, and by means of the heat you may cook your food."

It was hot air. The "secret" was something he had visualized but not realized, a thermal regulator to cut off current to the filament before it melted or burned out. The real secret, Edison found, arguing it out with Charles Batchelor, was to raise the voltage to push a small amount of current through a thin wire to a high-resistance filament. It was an application of the law propounded in 1827 by the German physicist George Ohm, but it was still imperfectly understood. Edison himself said later, "At the time I experimented I did not understand Ohm's law. Moreover, I do not want to understand Ohm's law. It would stop me experimenting." This is Edison in his folksy genius mode. Understanding the relationship linking voltage, current, and resistance was crucial to the development of the incandescent lamp, and he understood it intuitively even if he did not express it in a mathematical formula.

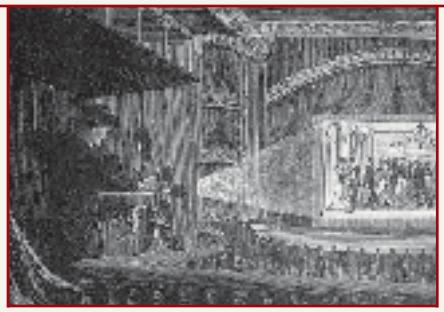
## SUCCESS

After two sleepless weeks, Edison relieved the carbon rollers. His new idea was to bake the carbon into a length of plain cotton thread. On the eighth attempt, on October 21, the dexterous Batchelor held his breath carrying a tiny thread bent into the shape of a horseshoe to Boehm's house for insertion in a bulb. "Just as we reached the glass blower's house, the wretched carbon broke," Edison recalled. "We turned back to the main laboratory and set to work again. It was late in the afternoon before we produced another carbon, which was broken by a jeweler's screwdriver falling against it. But we turned back again and before nightfall the carbon was completed and inserted in the lamp. The bulb was exhausted of air and sealed, the current turned on, and the sight we had so long desired to see met our eyes."

Thread No. 9, lit at 1:30 a.m., lasted until 3 p.m.—13 1/2 hours, whereupon Edison added a stronger battery to boost the light to 30 candles, or three times gaslight. They watched the tiny filament struggle with the intense heat. The light continued for 60 minutes. It was a crack in the glass that turned the room back into darkness—amid the cheers of exhausted men. They had proved that a carbon fil-



PHOTOS COURTESY OF THE U.S. DEPARTMENT OF THE INTERIOR



ament in a vacuum would work.

After examining the charred filament under a microscope, Edison launched another search for an organic fibrous material, some form of cellulose that might yield even more resistance than cotton. By November 16, they settled on a piece of common cardboard. Edison records: "None of us could go to bed, and there was no sleep for any of us for 40 hours. We sat and watched it with anxiety growing into elation. The lamp lasted about 45 hours, and I realized that the practical incandescent lamp had been born."

Already, Edison was preparing to establish electric beachheads in New York, Paris, and London. The lab staff worked frantically making bulbs by hand, one by one, so that on New Year's Eve, when Edison opened Menlo Park to a public exhibition, he had around 300 bulbs.

What Edison attempted next can be characterized only as awesome, as if having climbed Everest he sprouted wings and flew from the top. "There is a wide difference," he said, "between completing an invention and putting the manufactured article on the market," but marketing an electric light bulb was the least of it. He had to invent the electrical industry. He had to conceive a system down to its very last detail—and then manufacture everything in it. He had to build a central power station; design and manufacture his own dynamos to convert steam power into electrical energy; ensure an even flow of current; connect a 14-mile network of underground wiring; insulate the wiring against moisture and the accidental discharge of electrical charges; install safety devices against fire; design commercially efficient motors to use electricity in daylight hours for elevators, printing presses, lathes, fans, and the like; design and install meters to measure individual consumption of power; and invent and manufacture a plethora of switches, sockets, fuses, distributing boxes, and lamp holders.

Luckily, Edison was worth around half a million dollars by then; Western Union had made big payments for his telegraph and telephone patents. In December 1881, he began to dig up cobblestones for conduits radiating symmetrically outward from Pearl Street. He was often down in the trenches in the raw early hours checking the connections made by the wiring runners. It took six months to do the work.

## LIGHTS ON

Sunday was normally the one day of the week reserved for his neglected wife, Mary, and their two children, but Sunday, Sept. 3, 1882, was different. All day and into the night Edison was on Pearl Street rehearsing every part of the operation for the system's debut due on Monday afternoon. So much might go wrong when he gave the orders for the steam to flow. "The gas companies were our bitter enemies, ready to pounce upon us at the slightest failure," he recalled later. When the chief electrician pulled the switch at 3 p.m., only one of the six dynamo sets worked and the steam engine was wobbly. But Edison, over at the offices of Drexel, Morgan & Co., ready for the big moment when he would ceremonially connect the 106 lamps there, was not disappointed. They all came on! They came on, too, at the offices of the *New York Times*, "in fairy tale style," said the paper, 52 filaments appearing to glow stronger as the night drew in.

Edison's success was at once a vindication and an incitement. His patent was swiftly challenged, his ideas stolen. But Edison would not sue; he would out-invent and undersell them all. When Pearl Street went on line in 1882, no fewer than 200 companies across America had already signed up with the Edison Company for Isolated Lighting, using 45,000 lamps a day: companies like Marshall Field's dry goods store in Chicago, George Eastman's Photographic company in Rochester, N.Y., the Stetson Hat Co. in Philadelphia, and Dillard's Oregon Railway and Navigation Co. The electrical evangelists Edison had sent overseas had done their work well. A London newspaper summed up the acclaim: "There is but one Edison."

*Adaptation from the book* They Made America: Two Centuries of Innovators From the Steam Engine to the Search Engine, *by Harold Evans. Copyright 2004* U.S. News & World Report, *L.P. Reprinted with permission.*

# Beautiful

THE CANADIAN ROCKIES OFFER VISITORS SPECTACULAR SIGHTS AND A PLACE TO RELAX. THE BREATHTAKING BEAUTY OF ALBERTA'S BANFF IS A NATURAL WONDER. WITH SOARING PEAKS OF SNOW-COVERED MOUNTAINS AND GLACIERS, BANFF HAS BEEN WELCOMING INTERNATIONAL VISITORS FOR MORE THAN A CENTURY.

Photography provided by:
Alberta Economic Development's
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# Banff

Beginning with Hot Springs in the fall of 1883, three Canadian Pacific Railway construction workers stumbled across a cave containing hot springs on the eastern slopes of Alberta's Rocky Mountains. From that humble beginning was born Banff National Park, Canada's first national park and the world's third. At 4,540 ft (1,384 m) above sea level, the city of Banff is "Canada's Highest Town."

A train whistle blows in the distance as a reminder of the area's railway roots while designer shops dot the streetscapes. From a sleepy summer resort that used to close its doors in the winter months, Banff has now grown into a year-round attraction. People from all over the world come in search of the Banff experience, whether it's in the restaurants, shops and cultural activities, or adventures in the wilderness. On Banff's bustling main avenue, virtually every language, from German and Japanese to French and Spanish, can be heard. Yet only minutes away from all the action, a quiet walk along the banks of the Bow River reminds you that the town is located inside Canada's premier national park.

DESPITE SNOW AND ICE, BANFF'S VALLEYS, MOUNTAINS, GLACIERS, FORESTS, MEADOWS AND RIVERS OF BANFF NATIONAL PARK ARE SOME OF THE WORLD'S PREMIER DESTINATION SPOTS.

## Banff National Park

Today, Banff National Park spans 2,564 square miles (6,641 square km) and is one of four adjoining mountain parks. In total the parks comprise of more than 7,813 square miles (20,235 square km) of spectacular Canadian Rocky Mountain landscape. For current visitors, bathing in these same hot springs is but one of many activities offered in Canada's foremost national park. When you visit the Banff area, and nearby Lake Louise, you will see why each year more than 4.5 million visitors come to enjoy the unique feeling of the Canadian Rockies and to experience why the United Nations in 1985 declared the area a "World Heritage Site."

Banff National Park is a year-round playground in the Canadian wilderness, a four-season recreational area that offers everything from 7,558 acres of downhill skiing/snowboarding terrain to hundreds of miles of mountain trails. Visitors can explore the landscape by bus or car, canoe or raft, on foot or skis. The many sightseeing opportunities are popular photographed sites depicting some of the most spectacular scenery and wildlife on earth.

Banff National Park is a hiking wonderland, containing over 1,000 miles (1,600 km) of trails, more than any other

mountain park. Hikers can find anything from a one-hour jaunt up a mountain to a month-long backcountry excursion into the lonely, wild regions of the park.

Banff is home to a number of outstanding geological and ecological features. The park is in the Rocky Mountain natural life zone, with terrain divided into three separate eco-regions: the mountain, the sub-alpine and the alpine. Each eco-region is characterized by a different plant and animal regime, as well as a different climate and elevation.

The Trans-Canada Highway, the Banff-Radium Highway, the scenic Bow Valley Parkway and the awe-inspiring Icefields Parkway are all major travel routes that bisect the park, enhancing visitors' chances of seeing the abundant wildlife inhabiting the mountain regions. Lucky travelers may see elk, deer, bighorn sheep, mountain goats, moose, black bears, grizzly bears, wolves, and a host of other large and small mammals.

The weather in the Canadian Rockies is variable due to the high elevation and rugged topography. Cool, crisp air and warm days are typical of autumn in the Canadian Rockies. Warming Chinook winds can bring spring-like conditions in winter, while spring offers both skiing and golfing opportunities. The summer climate is pleasant with low humidity, warm temperatures and daylight hours stretching until 11 p.m.

Despite snow and ice, Banff's valleys, mountains, glaciers, forests, meadows and rivers of Banff National Park are some of the world's premier destination spots. Visitors can tour historic sites, soak in hot springs, stroll along the shores of Lake Louise or spend a night in the historic Banff Springs Hotel. Visitors can also continue their journey and drive the Icefields Parkway into the majestic mountains of adjoining Jasper National Park.

*Story provided by the Banff/Lake Louise Tourism Bureau. For more information, call 403-752-8421 or visit www.banfflakelouise.com*

## Neighboring Lake Louise

In 1882, guided by a Stoney Indian, Tom Wilson became the first white man to discover what native Indians called "Lake of Little Fishes." He named his discovery Emerald Lake, but it was later changed by the Geographic Board to Lake Louise in honor of Princess Louise Caroline Alberta, fourth daughter of Queen Victoria.

Lake Louise, with its blue-green water set against the stark backdrop of Victoria Glacier, is probably the most beloved and most photographed scene in the Canadian Rockies. Not only have international royalty, Hollywood stars and heads of state come to Lake Louise to relax, but increasingly the rest of the world is discovering its simple charms as well. Romantic and relaxing, the pace in Lake Louise attracts people who want to savour the finer things of life; a good book in front of a fireplace, the stillness of the outdoors, or a quiet walk after dinner. The Chateau Lake Louise presents lakeside views of the towering Victoria Glacier, offering old-world charm and elegance amidst the wilderness. The lower village of Lake Louise holds an array of fine dining, first class accommodations and shopping. A scenic drive will bring visitors to the awe-inspiring Moraine Lake.

## Quick Facts About Alberta

- Canada's first/oldest national park - **Banff National Park**
- One of the world's most photographed lakes - **Moraine Lake**
- Alberta is the only place in North America where the prairie, boreal forest and mountain ecosystems collide.
- Alberta has 300 species of birds, 90 mammals, 18 types of reptiles and amphibians, 50 species of fish and 1,700 flowering plants.

PHOTO BY RICHARD CHAMBERLIN

**Jay McCutcheon just keeps on running.**

# Getting to the Finish Line

*Jay McCutcheon fights back after vertebral artery dissection*

BY LESLIE LICHTENBERG

Samuel Johnson, one of the most quoted men of the 18th century, once said, "Great works are performed not by strength but by perseverance." Such can be said of Jay McCutcheon, who throughout his adult life has performed many noteworthy deeds through both strength and determination. A former pro soccer player, sports marketer and promoter of urban living, Jay spends all his time these days sharing the message and mission of the Active Survivors Network (ASN), an organization dedicated to promoting health and fitness for survivors of catastrophic or long-term illness.

Jay founded ASN in 2003, less than two years after he suffered a sudden and debilitating brain stem stroke, the result of a fluke vertebral artery dissection. Ironically, the stroke occurred just three weeks before Jay was to compete in the Ironman USA Triathlon, a grueling sporting event that includes a 2.4-mile swim, a 112-mile bike ride and a complete marathon (26.2 miles), all in succession. The dissected artery, one of four that provides blood flow to the brain, created a blood clot that impacted the brain stem, leading to a virtual shut down of all of Jay's involuntary systems. In short, this man—young, strong and in peak physical condition—was forced to face the cruel reality that he was unable to walk, talk, swallow or see.

"I don't know why it happened," admits Jay. "Could the stroke have been a result of a genetic defect, years of hard physical training, or the pounding my body took in soccer? There are many possibilities," he says.

Whether or not seven years in professional sports contributed to the unexpected turn of events in Jay's life may never be known. However, his early career in pro soccer—including separate turns with the Ft. Lauderdale Sun, Baltimore Blast and Chicago Sting – did pave the way for a successful transition to sporting goods marketing with Umbro USA, at the time the country's leading provider of soccer apparel.

"It was a good time to make a career move," says Jay, who was 30 when he hung up his soccer cleats in 1990. "The game was growing and we [Umbro] were growing with it."

In 1998, Jay left Umbro and returned to Baltimore and took on a new professional challenge, as vice president of marketing for the Downtown Partnership of Baltimore. He spent the next four years implementing marketing programs to attract businesses and residents to the city. Then, in 2001, toward the end of his training for the Ironman, Jay began to experience dizziness.

"I attributed it to fatigue and the long, hard months of training," says Jay.

After checking in with his doctors and undergoing an MRI that revealed nothing, Jay resumed his daily routine. The vertebral artery dissection and resulting brain stem stroke, which occurred just a few short days after his initial symptoms surfaced, changed Jay's life forever. Following seven days on a respirator in the University of Maryland Medical Center's Neurological Intensive Care Unit, Jay spent two weeks in rehabilitation and thereafter began the long, arduous journey toward recovery. Confined to a wheelchair with little more than weekly at-home physical therapy sessions to guide his recuperation, Jay quickly grew frustrated.

"I was left to my own devices to figure out how to recover," he says. "Recovery is all relative, but I was not prepared to sit in front of the television for the next 25 years."

With the support of his wife, Kay, a personal trainer, Jay devised his own plan of recovery, beginning small and working toward more challenging goals. Shortly after reaching his first milestone, getting out of the wheelchair and into the car, Jay boldly forged ahead with the keenly focused and sometimes unforgiving mentality that only an athlete knows. Soon he was swimming, with his stomach tube still intact, and later, with the help of a friend who is a vestibular therapist, began to test the natural "self-rewiring" of the brain that would eventually improve his sense of balance.

**"THERE IS NO MANUAL FOR RECOVERY FROM A CATASTROPHIC EVENT OR ILLNESS," SAYS JAY.**

As his remarkable journey toward healing gained momentum in January of 2003, Jay competed in the Disney Marathon and delivered the American Stroke Association's keynote address at the pre-marathon banquet—Jay had an epiphany.

"There is no manual for recovery from a catastrophic event or illness," says Jay. "When your lifestyle consists of going to the gym every day and an unexpected debilitating condition virtually changes that overnight, that experience itself becomes the true and valuable learning tool."

Recognizing the importance of physical fitness in his own recovery and the dearth of medical research on the impact of physical activity on survivorship, Jay was compelled to launch ASN. Dedicated to promoting improved quality of life through physical fitness and advocating for survivor needs in the areas of athletics and activity, ASN was established to reach out to the more than 50 million Americans recovering from or living with long-term illness. Using the Internet as its primary communication venue, ASN connects survivors who, in their efforts to deal with this lack of resources from the medical community, share common experiences, regardless of their diseases.

"Education is the first step; motivation is the second," explains Jay, who describes the majority of ASN members as "the converted," those who have already made the leap in recognizing the critical, perhaps life-saving role fitness plays in recovery and survival.

In addition to member matching, ASN hosts and sponsors various sporting events geared specifically to survivors, including its own Survivor Harbor 7 in downtown Baltimore, the country's first race with a survivor division for athletes with chronic disease or recovering from a catastrophic illness. Last year, ASN received a noteworthy boost by becoming the first non-cancer related organization to receive two grants from the Lance Armstrong Foundation.

While much of his energy today is devoted to building ASN, Jay manages to make time for a daunting daily workout regimen that would send most healthy individuals running for the showers. Despite continued nuisances, including double vision and a lack of sensation on his left side, Jay has no plans to give up swimming and running.

"When it hurts, you just hang in there, because eventually it goes away," says Jay. "I know that it's possible to run through it, and I remind myself that some people are just trying to get to the finish line."

# The Four Exercises You Should Be Doing

*Strengthen your body with these do-anywhere moves.*

BY CAREY ROSSI

Getting the best quality is paramount, whether it's building materials, cars or food. Paying less for it is even better. Exercise is no different—you want to get the best results in the shortest amount of time. After asking fitness trainers and researchers around the country which exercises give more bang for the exercise buck, the moves below won their approval. "All of the exercises are multi-joint, large muscle group exercises, which means they will create potentially more energy expenditure," says Chris McGrath, MS, a certified strength and conditioning specialist in New York City. Focusing on strength, balance and stabilization, the below exercises are easy to do anywhere, anytime.


## 1. The Push-Up

"Push-ups work the most number of upper body muscles; the chest, triceps, shoulders—and your core also comes in play because you need to tighten your abs to keep your back from sagging," says Cindy Whitmarsh, CPT, president of UltraFit Nutrition Systems in San Diego, California.

**How to do it:** Assume a prone position on the floor with your bodyweight supported by your hands and your knees or balls of your feet. Palms should be slightly wider than shoulder width; arms are extended. Body stays straight through the movement. Descend until elbows are bent approximately 90-degrees, then straighten arms to return to the starting position, instructs Lisa A. Reed, M.S., CSCS, Director of Strength & Conditioning at National Cathedral School in Washington, DC. Do up to 3 sets of 12-15 repetitions.

**Tip:** Whitmarsh suggests that beginners start with a wall push-up (hands on wall, feet further away than shoulders and lowering chest to wall), then graduate to floor push-ups from knees and then basic military push-ups.

## 2. The Squat

Squats target almost all the muscles in your legs and your butt. "They can be as simple as chair squats (standing and sitting), or can be performed easily with weights in the hands (such as evenly weighted, handled grocery bags)," says McGrath.

**How to do it:** Stand erect with your knees slightly bent and your feet about hip with apart. Squat down, pushing your hips back as if you were sitting in a chair, bringing your thighs parallel to the ground. Squeeze your glutes (the muscles in your butt) as you press back up. Do 2 sets of 8-10 repetitions slowly twice a day.

**Tip:** Michele S. Olsen, Ph.D., FACSM, professor of exercise science at Auburn University Montgomery in Alabama suggests when first doing any kind of squat movement that you

PHOTOS BY KRISTEN BECKERMAN

use a door knob on a closed door for balance by holding it with one hand. Do 2 sets of 8-10 repetitions slowly twice a day.

## 3. The Lunge

"Lunges target two primary muscles groups: 1) the hip extensors, comprising of the glutes and hamstrings; and 2) the knee extensors, made up of the four muscles collectively known as the quadriceps," says Reed. "The muscles used in the lunge are the same as those utilized in the squat, but the lunge provides greater range of motion, allowing more substantial glute and hamstring development."

**How to do it:** Stand with your feet shoulder-width apart. Step backward with your right foot. Drop your hips straight down, bending both knees as you go. Continue to lower your body by bending your knees until there is about a 90-degree bend in each. Return to the start position (standing upright) by pushing up with your forward leg. Keep your body upright at all times – do not bend forward at the waist. Reed recommends doing 12-15 repetitions each leg up to three times.

**Tip:** "The most important factor here is balance," says Reed. She suggests that while performing the lunge, you hold the stomach muscles tight and keep the shoulders over or slightly in front of the hips.

## Bonus Move

### 4. Standing Back Extensions

"This exercise is a back, chest and neck reliever," says Dr. Olsen. "It counter-balances all of the leaning and bending-over [we do]. Physical therapists recommend similar things to workers who stand and lift a lot on the job."

**How to do it:** Olsen instructs that while standing up, place hands on the back of the hips, kind of like putting your hands into your back pant pockets, then, stick your chest out and direct it upward to the ceiling as your back curves inward, hold for 5 counts and rest for 5 counts. Repeat 5 times; do several times a day.

# The Impact of the Dollar on the U.S. Consumer

By Daniel E. Wagner

Recently, there has been much attention in the financial press to the "falling dollar." The average U.S. person may be confused by the falling dollar because a U.S. dollar is still worth one dollar in U.S. currency. The reference to the falling dollar refers to the value of the U.S. dollar as compared to a foreign currency. Basically, the dollar would fall against a foreign currency if it now costs $2.00 U.S. dollars to buy the same basket of goods that previously cost $1.50 U.S. dollars in another country.

The relationship between the U.S. dollar and a foreign currency is affected by several factors. One factor that has a large impact on the value of the dollar is whether the U.S. has a trade deficit with a foreign country. In general, a large U.S. trade deficit will often lead to a declining dollar against the relevant currency.

The U.S. dollar has an economic relationship with every other foreign currency except for currencies that are pegged to the dollar. For example, the Chinese yuan has a direct relationship with the U.S dollar. Therefore, the "falling dollar" does not have an immediate impact on the price of Chinese goods. Specifically, the U.S. dollar's relationships with the euro and the yen are of primary significance.

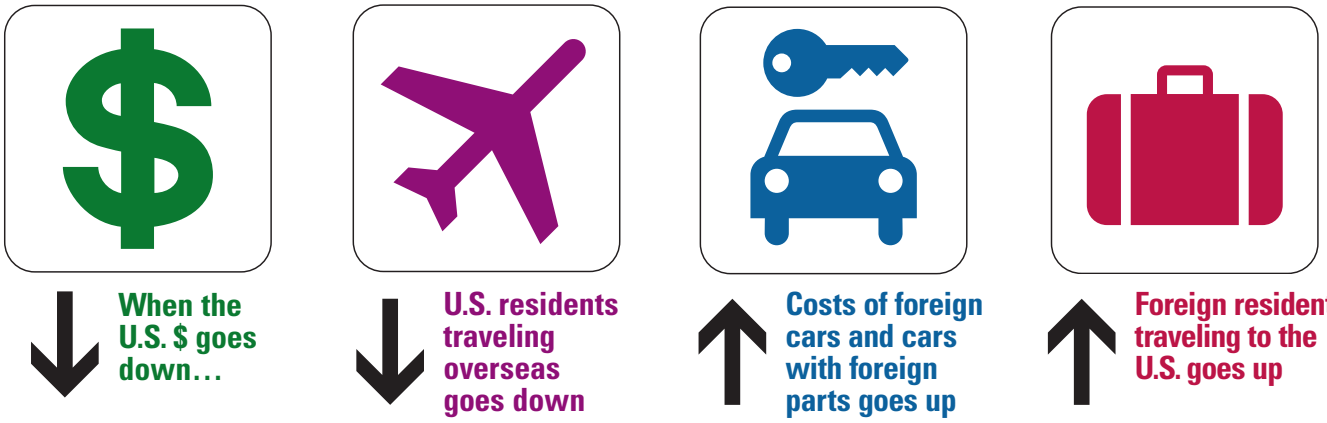
We are currently in a period where the value of the U.S. dollar has declined versus the yen and the euro. This decline has several direct results. First, it now has become increasingly expensive for U.S. tourists to travel to Europe. Conversely, the United States has become a prime vacation destination for Europeans because of the falling dollar.

A falling dollar also increases the costs of certain foreign goods for U.S. consumers. For example, the decline in the U.S. dollar versus the yen could lead to higher prices for Japanese cars and electronic equipment. However, foreign manufacturers may reduce their profit margins to keep rising prices from scaring off U.S. consumers.

Large U.S. global companies usually benefit from a falling dollar. For example, many large corporations such as Coca-Cola, Procter & Gamble and IBM have huge foreign divisions. The profitability of these divisions often increases when the U.S. dollar falls.

Similar to many other economic patterns, the dollar will rise and fall versus foreign currencies over time. One day, the popular press will once again be writing stories about how the strong U.S. dollar is causing an influx of U.S. tourists to Europe.

*Daniel E. Wagner is the founder and president of Wagner Capital Management Corp., a registered investment advisor located in Baltimore, Maryland. Mr. Wagner can be reached at 410-653-7979.*



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