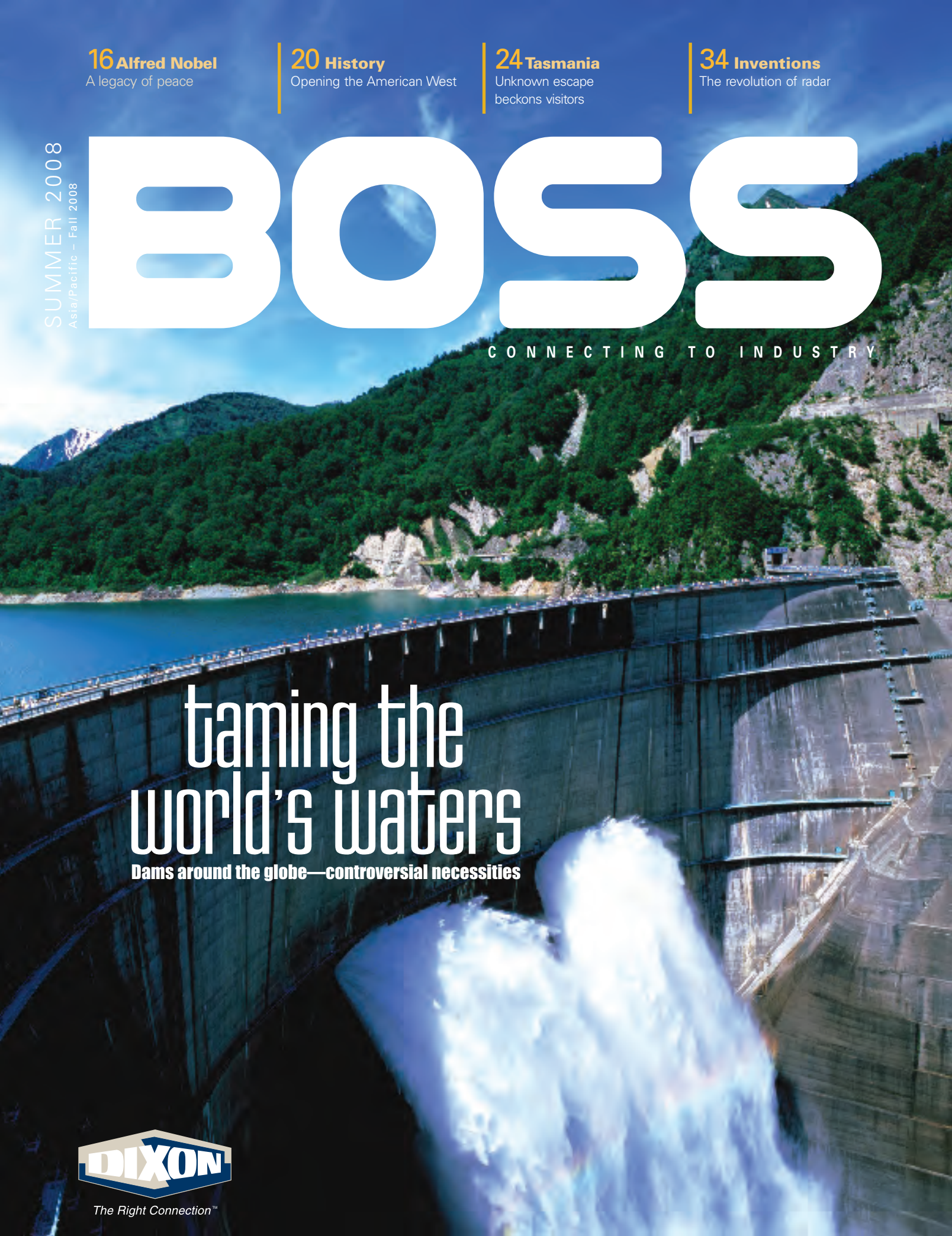
SUMMER 2008
Asia/Pacific – Fall 2008

BOSS

CONNECTING TO INDUSTRY



taming the world's waters

Dams around the globe—controversial necessities

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EXPECTATIONS

ARE MET AND THEIR ORDERS DELIVERED ON TIME.

I TAKE THAT RESPONSIBILITY SERIOUSLY."

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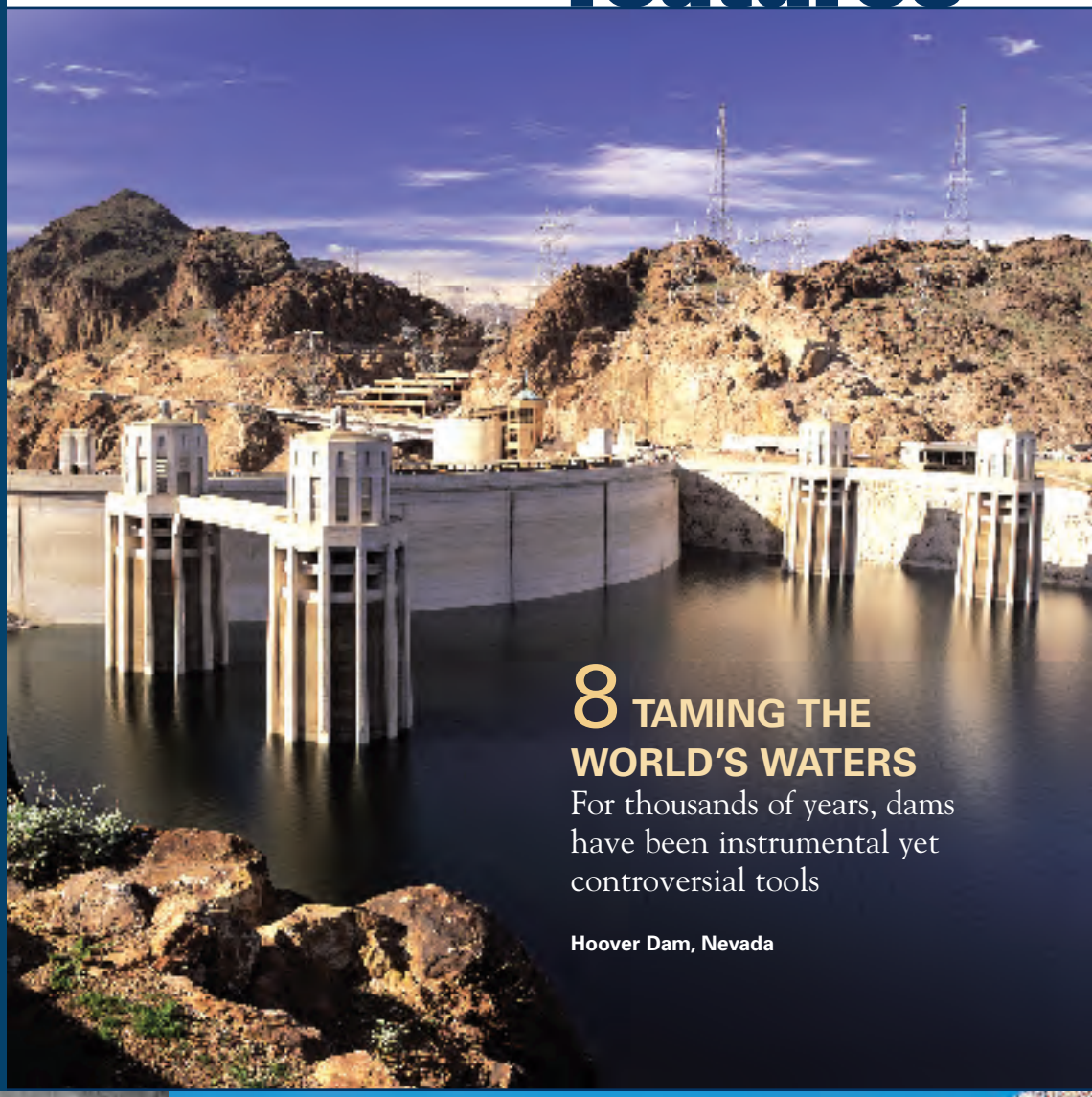
SUMMER 2008
ASIA/PACIFIC – FALL 2008

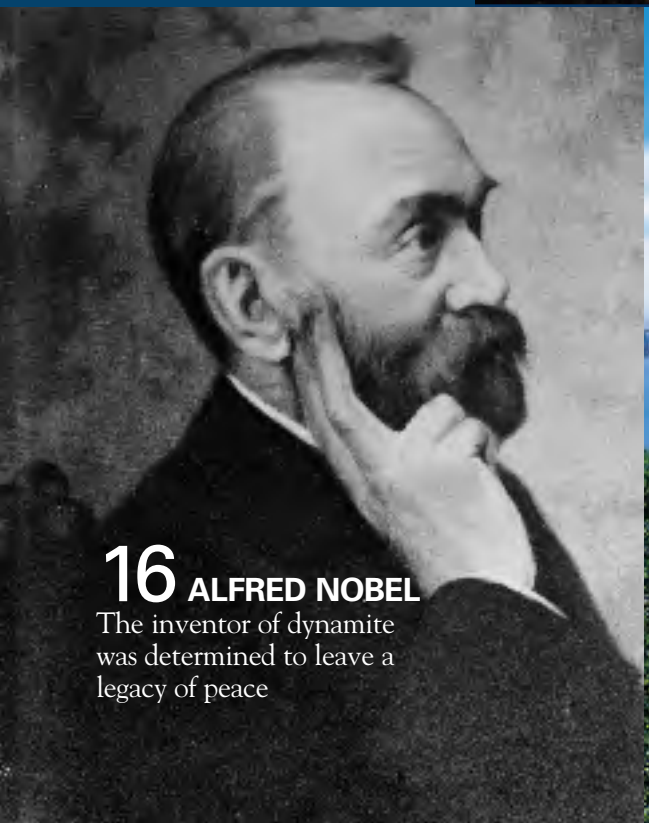
departments

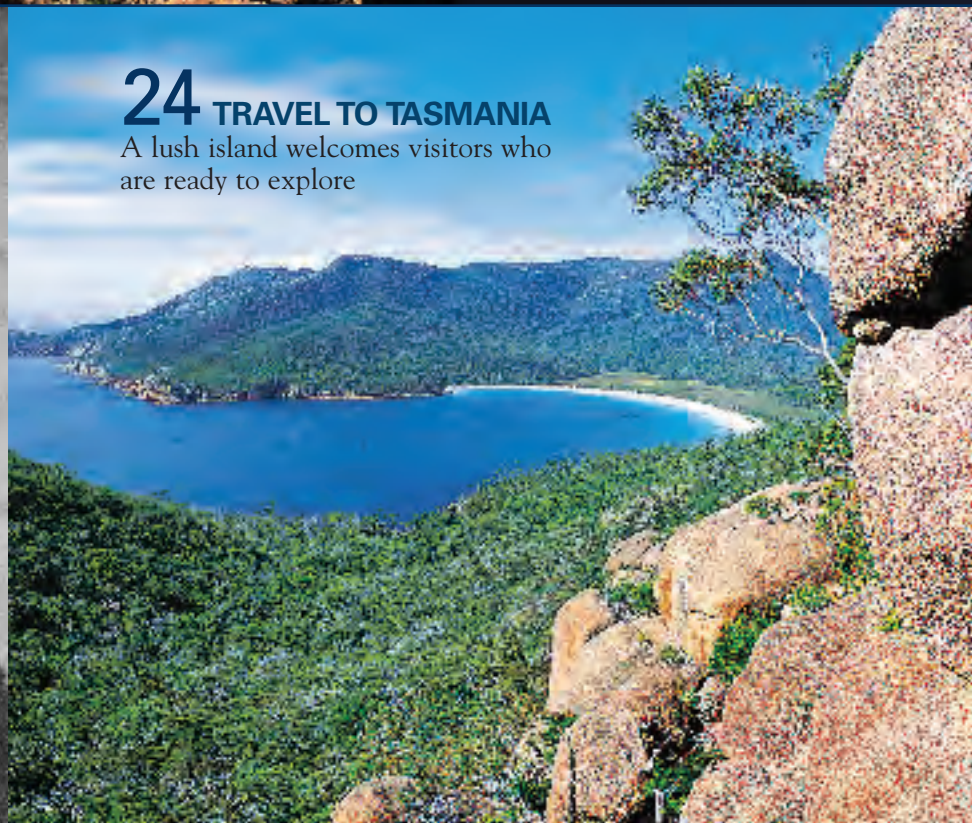
Cover: Kurobe Dam, Japan's largest, is on the Kurobe River in Toyama Prefecture, on the island of Honshu, Japan

features



Hoover Dam, Nevada





How Will You Be Remembered?

It can be easy to lose sight of life's big picture while we're working at the day-to-day activities that make time fly by. But every now and then, I think it's important to step back and take a look at how things are going. Are you living your life the way you really want to? Do you act, on a daily basis, in a way that would make your parents and children proud?

Our biography in this issue of *BOSS* magazine is about Alfred Nobel, the scientist who created the coveted Nobel Prizes. It was in taking stock of his life's work that Mr. Nobel decided that he wanted there to be more meaning to the legacy he left behind.

Alfred Nobel's decision to create the prizes that honor the greatest achievements in physics, chemistry, physiology or medicine, literature and peace have changed the world and the way we think of Nobel as a person.

We may not all be able to contribute the way Alfred Nobel did, but we can do something that will make a difference. At Dixon headquarters, we are proud to have a team of 28 people, myself included, who, along with 100 other community volunteers, go into the public school system on a weekly basis to talk with children from pre-K through ninth grade. These volunteers give 20-minute discussions on the six pillars of character: trustworthiness, respect, responsibility, fairness, caring and citizenship. This contact is good for the children, but is also a very positive experience for the employees, who give back to the community.

Think about how you will be remembered. It might inspire you to make some changes in your life that will affect you, your family, your co-workers and maybe the world.

Dick Goodall

Dick Goodall

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The Tao of Racquetball

By Michael Josephson

Already my re-entry into racquetball has yielded unexpected dividends. I've found that pounding a little rubber ball against a wall in an enclosed room 40 feet long, 20 feet wide and 20 feet high can reveal profound truths about life. Well, at least they seem profound at the time.

For example, in the past I often hurt myself crashing into walls or pulling muscles in a wanton pursuit of every shot. Now, I'm much more deliberate about what balls I go for. Sure, this new strategy was induced by my considerable physical limitations, but that doesn't dilute the wisdom of realizing how important it is in life to choose one's battles. If you go "all out" on every single play regardless of the likelihood of success, you may not have the resources to make more sensible efforts.

Yet, as I began to develop a little more agility and skill, I realized that I was giving up too often and too easily. Some balls were "gettable" with a reasonable but aggressive effort. Being too conservative is as unwise as indiscriminate recklessness. Yes, you should pick your battles, but be careful that timidity, fear or laziness don't blur your vision as to what's possible. You can't succeed at anything unless you push yourself beyond perceived limitations. We can all do more than we think we can.

Finally, my natural tendency was to try to win points by hitting the ball as hard as I could. In fact, placement and timing are much more important than raw power. I scored more often when I was strategic and thought about the angles. So it is with most of life's challenges. Think ahead, have a plan, use tact. It's a lot easier to persuade than pulverize the opposition.

The Reluctant President

President William Howard Taft was single-minded in his goal … to become chief justice of the U.S. Supreme Court

By Lisa De Nike

The only American ever to have served both as president of the United States and chief justice of the U.S. Supreme Court, William Howard Taft is remembered not for his achievements, but for a largely unsuccessful presidency and an obvious discomfort with the political process.

Taft was born on September 15, 1857, in Cincinnati, the third of five children of a prominent Ohio family headed by a distinguished judge. Like his father, Alphonso, Taft graduated from Yale University, where he was second in his class and a member of the well-known "Skull and Bones Society." He studied law at the University of Cincinnati and subsequently went into private practice.

At age 29, he married the ambitious and intellectual Helen "Nellie" Herron. Born and raised in Cincinnati, Nellie worked intermittently as a teacher and, from a young age, had a strong interest in music. She was instrumental in founding the Cincinnati Symphony Orchestra and served as president of its board of directors from 1893 to 1900. "I found, at last, a practical method for expressing and making use of my love and knowledge of music," she once said. As a teenager, Nellie visited the White House, and from then on, she was determined that if she married, it would be only to a man who could be president.

William Howard Taft held several judicial positions between 1887 and 1890, including judge of the Cincinnati Superior Court and member of the 6th U.S. Circuit Court of Appeals. Though he did not hide the fact that his lifelong ambition was to serve as chief justice of the U.S. Supreme Court, Taft was pushed to strive for more than just a judicial career by Nellie.

During their time in Washington, D.C., while Taft was serving as solicitor-general (1890), Mrs. Taft did all she could to further her husband's career through social connections. Nellie's fears that her husband's ambition was focused on the judiciary and not on the presidency were confirmed when he accepted President Benjamin Harrison's offer to serve as a federal Circuit Court judge, which he did from 1892 to 1900.

When President William McKinley asked Taft to travel to the Philippines to serve as president of the commission overseeing the newly won territory, Taft was disappointed and reluctant, but, pushed by his wife and the promise from McKinley of a future position on the Supreme Court, he agreed.

Taft found his work in the Philippines fulfilling, even to the extent that he twice turned down President Theodore Roosevelt's offer of a Supreme Court appointment to finish his work there. Taft ultimately became governor of the islands, and by the time he left in 1903 to become Roosevelt's secretary of war, the islands were pacified and a civil regime had been established. Even though Taft was pleased with his newly appointed position, he knew that his wife held loftier goals for him. She urged him to pursue the presidency.

During Roosevelt's second term as president, Taft met

with the emperor of Japan and temporarily became civil governor of Cuba when Roosevelt sent troops to that country to restore order during a revolt. During those years, Taft also acted as secretary of state periodically. Despite these globe-trotting diplomatic experiences, Taft repeatedly told Roosevelt how much he wished to become chief justice.

Roosevelt, however, had other plans for him. He, too, thought that Taft should become the next president and, after much persuasion from both Nellie and Roosevelt, Taft reluctantly joined the presidential race. Indeed, with Roosevelt's backing the 51-year-old Taft handily defeated William Jennings Bryan and found himself taking the Oath of Office on a windy, wet March day in 1909.

Though he had promised to continue Roosevelt's agenda, it did not take long for Taft (who lacked Roosevelt's charisma and struck many people as "low energy") to begin alienating those on all points of the political spectrum with his dogged and very law-centered approach to issues.

During his tenure, a postal savings system was established and the Interstate Commerce Commission was directed to set railroad rates. But issues that antagonized colleagues and Roosevelt supporters overshadowed any successes that Taft may have had.

As president, he initiated 80 antitrust lawsuits, including one against U.S. Steel (the country's largest corporation) for an acquisition that Roosevelt had approved. This angered many: Roosevelt, who reportedly was humiliated; big business (for obvious reasons); and even the antitrust lobby, who disapproved of Taft's conservative rhetoric on the topic.

Taft alienated many liberal Republicans (who later formed the Progressive Party) by defending the Payne-Aldrich Tariff Act, which unexpectedly continued high tariff rates. Progressives also were irritated that Taft upheld his secretary of the interior, accused of failing to carry out Roosevelt's conservation policies.

Many historians believe that part of the public's disillusionment with Taft was due to his introverted personality and "judicial" temperament. He was clearly overshadowed by his ebullient predecessor: the public joked that Taft stood for "take advice from Theodore." The Republicans renominated Taft in 1912, but he had so disappointed his mentor and friend that Roosevelt opposed Taft's nomination and bolted from the Republican Party to lead the Progressives, creating the opening that Democrat Woodrow Wilson needed to take the election.

After his loss, Taft, who loathed campaigning anyway ("the most uncomfortable four months of my life"), returned to Yale as a professor of law and president of the American Bar Association.

In 1921, Taft's fondest wish finally came true when he was appointed by President Warren G. Harding to replace Chief Justice Edward Douglass White on the Supreme Court. Taft held that position until just before his death in 1930. To Taft, it was his greatest honor: "I don't remember that I ever was president."

taming the

With a history dating back 7,000 years, dams continue to be instrumental—and controversial

By Virginia Hughes

world's waters

On December 14, 1994, in the basin of China's mighty Yangtze River, construction began on what will be the world's largest dam: the Three Gorges. The Chinese government took on this 17-year, $29 billion-plus building project in the Hubei Province primarily to end thousands of years of disastrous flooding downstream, especially near Wuhan and Shanghai. (In the last century alone, the untamed waters have taken more than 1 million lives.)

But in addition to flood control, the dam's builders say that its hydroelectric power plant will generate a sizable portion—18.2 million kilowatts, or about as much as 18 nuclear power plants—of the energy needed to fuel China's growing economy. The 1.5-mile-wide, 607-foot-tall concrete structure, they say, will support a reservoir 400 miles long that holds 10.4 trillion gallons of water.

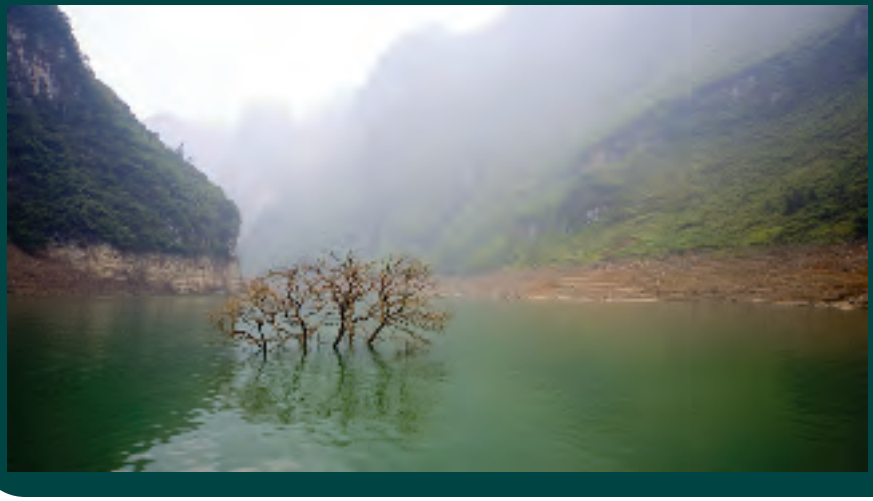
In almost 14 years since construction began on this high-profile site, spectators across the globe have raised their eyebrows at the touted natural and sociological benefits of the Three Gorges. The reservoir, projected to be 574 feet deep when the dam is finished, has already forced 1.2 million villagers to relocate and has destroyed several archaeological sites. Scientists worry that the steep hills surrounding the dam will lead to erosion and landslides, and that algal blooms popping up downstream will threaten aquatic species. (See sidebar, below: "Environmental Impacts.")

At the same time, political leaders fear conflicts over land shortages. Last September, a group of experts in China agreed that the construction of the Three Gorges has had an adverse effect on the environment around the Yangtze River and "if protective measures are not taken, the project could lead to catastrophe."

The Three Gorges project has met with obstacles since it was first proposed, almost a century ago, by Chinese revolutionary Sun Yat-sen. For now, it's slated for completion in 2011. In scale, it dwarfs every dam that's come before. But its ecological and political issues aren't unique. Controversy inevitably surrounds the construction of each of the 800,000-plus working dams across the world, and especially the 45,000 "large dams" that are more than 50 feet tall.

Still, few deny that building a dam—which, in effect, harnesses some of nature's most unwieldy forces—is one of mankind's greatest technological achievements. Not only do dams control floods and generate power, but most of

Environmental Impacts



The perception of dams in the public eye has diminished since the heyday of their construction in the mid-20th century, mostly because of environmental concerns. The majority of the world's large rivers are now dammed. This rise has undoubtedly fostered economic growth, but at the cost of landslides, healthy ecosystems and fish stocks, and forced resettlements of local species—including humans.

Landslides have become one of the most worrisome consequences of the Three Gorges project. Geologists

Photo pages 8-9: Floodgates are opened at the Three Gorges Dam on July 22, 2007, in Yichang, in central China's Hubei Province, to release floodwaters.

On July 25, 2007, floodwaters are discharged through the sluice on the Three Gorges Dam, left. An aerial view of the Hoover Dam in Nevada, right.

them also provide a reliable crop irrigation and safe river navigation for grain barges. Most historians agree that the "golden age" of dam building has passed, but it's still a growing global industry: China has about 19,000 large dams, the United States about 5,500; and more than 200 dams at least 200 feet high are now under construction worldwide, mostly in China and Brazil, according to the World Resources Institute.

History

The earliest known use of dams dates back 7,000 years, when the residents of Mesopotamia (modern-day Iraq and western Iran) built dams to control the unpredictable water level of the Tigris and Euphrates rivers. Later, in 2600 B.C., the ancient Egyptians built a dam called Sadd Al-Kafara, near Cairo, but it soon collapsed under heavy rain. Demoralized, they never tried to build another.

Around 600 B.C., a court minister and China's first hydraulic engineer, Sunshu Ao, constructed a large earthen river dam on the Yangtze River called Si-Si Bei. Its irrigation reservoir, 62 miles in circumference, still exists today in the eastern province of Anhui. In the next 500 years, dams cropped up throughout the Mediterranean region, the Middle East and Central America. But they were all relatively short. A fifth-century dam in Sri Lanka, just 111 feet tall, was the highest in the world for 1,000 years.

Dams and dikes had huge importance in keeping water out of the lowlands of the Netherlands. The Dutch built

have found that pressure changes and water seeping out of the dam's giant reservoir are weakening its banks. As a result, the shore of the reservoir has collapsed in more than 90 places since last fall, according to officials. Landslides have produced waves as high as 50 meters (165 feet). Last July, a mountain tributary collapsed, killing 24 people.

A dam's primary effect is to block the natural flow of water in a river. But ultimately, a dam also will block the flow of nutrients and fish migrations, and alter the oxygen levels and water temperature. Before the dam era, for instance, the warm, silted and violent waters of the Colorado River flowed for 1,400 miles, ending in a lush delta in northern Mexico. Since then, 10 large dams have tamed the Colorado. But they've also depleted it of nutrients, significantly cooled its temperature, and dried up the Mexican delta. Consequently, native fish species like the bonytail chub and the Colorado squawfish are in decline, while invasive shrub species have taken over the riverbanks.

In the United States and Western Europe, a combination of regulatory pressures and innovative technology has mitigated some of these detrimental effects. The Tennessee Valley Authority, for instance, pumps dissolved oxygen into the bottom water layers of its dam reservoirs to replace the oxygen taken by hydroelectric turbines. This improves the water quality for fish downstream. Other river authorities have created simulated floods in order to increase the volume of existing sandbar habitats.

Hydroelectric dams, like the one in Paraguay, above, produce just under one-fifth of all electricity worldwide.

Beaver Dams

Beavers create dams for the same reason humans create dams: to control the unpredictable flow of stream or river water. After creating a stable reservoir, these flat-tailed and furry water rodents can focus their efforts not on navigating the river, but on finding food, staying warm, and hiding from wolf or bear predators.

Beavers live in colonies of six or more individuals, all sharing the same dammed water area. Stimulated by the sound of rushing water, after nightfall they'll pile mud, stones and freshly cut logs—from driftwood, birch and poplar trees—across the water, stopping only when the sound abates. If their stream has a fairly quiet current, they build straight dams. For more violent waters, they'll build curved dams that point upstream.

Large beaver dams—commonly 10 feet high and thousands of feet long—often cause flooding, sometimes causing harm to endangered species and expensive property damage. But they also provide natural wetlands with nutrient-rich banks for healthy local ecosystems. The longest beaver dam, 2,790 feet long, was found in Northern Alberta in October 2007, using the virtual global mapping program Google Earth.

their first dams in the 10th century, and big cities often grew around them because they were points of easy river crossing. (In the 12th century, Amsterdam was so named because it was where a dam crossed the river Amstel; Rotterdam was where a dam crossed the river Rotte.)

After the invention of the turbine in the middle of the 19th century, hydropower was possible. By 1900, hydropowered dams had been built in the United States, Italy and Norway. And 30 years later, after several technological improvements in turbines, the mega-dam was born.

In the early 1930s, most of the United States was deep in the economic depression that followed the stock market crash of 1929. A quarter of all Americans were unemployed. What's more, thanks to a creeping continental drought in the 1920s and 1930s, the American West turned into a dust bowl and thousands of farmers lost their crops. The Hoover Dam, first proposed by Secretary of Commerce Herbert Hoover in 1922, would solve both problems. By the time it was completed in 1936, the 726-foot concrete dam, built where the Colorado River crossed Boulder Canyon, in Nevada, created thousands of jobs and filled the previously dry irrigation ditches of the Imperial Valley.

In the next couple of decades, nine more large dams went up on the Colorado River, watering the fertile lands of the West and thus contributing to the growth of major cities. With U.S. President Franklin D. Roosevelt's creation of the Tennessee Valley Authority, 16 large dams were constructed between 1933 and 1944 in the Southeast United States.

A dam fever quickly spread across the globe. Post-colonial leaders built them to spur economic development; the first Indian Prime Minister Jawaharlal Nehru, for instance, called them "temples of development." But in the United States, the dam building spree ended by the early 1980s. Two decades from now, 85 percent of dams in the United States will be 50 years old or older, according to civil engineer Brad Iarossi, chairman of the Legislative Committee of the Association of State Dam Safety Officials.

"The really big dams are now being built in developing countries," says civil engineer Eric Ditchey, a project manager of new dam construction at a New Jersey engineering firm. In Southeast Asia and South America, especially,

Hydropower

The world's first hydroelectric power plant, constructed in 1882, converted the energy of the Fox River in Appleton, Wis., to make just enough power to light the home of paper manufacturer H.F. Rogers and one nearby building. Now more than a century later, hydroelectric dams—in which the pressure from water trapped in pipes, when released, can turn huge turbines that generate electricity—produce just under one-fifth of all electricity worldwide, accounting for more than 60 percent of global renewable energy efforts.

That means that, unlike energy dependent on fossil fuels like coal, hydropower produces only trace amounts of waste and greenhouse gas byproducts. The financial costs are low, too, since hydroelectric power plants don't need many people to keep them running and don't rely on increasingly expensive fuels.

The major drawback of hydropower is the environmental footprint of the dam that supports it, though the hydroelectric plant adds additional problems, too. The water that ultimately comes out of the turbine is warmer than it would be otherwise, which affects the habitats of local species. Moreover, the post-turbine water lacks naturally occurring sediment, which can mean riverbed and bank erosion downstream.

To make electricity at hydroplants, the water stored in a dam's reservoir flows down into a water turbine and a generator. The volume of the water and the difference in height between the reservoir and the turbine determine how much energy can be produced, with larger volumes and larger height differentials producing larger amounts of energy.

If a plant is meeting especially high electricity demands, then it will use "pumped storage hydroelectricity," where water moves between several reservoirs of different heights, harnessing the energy each time the height changes. A few hydroelectric plants use the predictable rise and fall of tides to generate power. (For more than a millennium, in fact, Europeans have harnessed the power from such "tide mills" to grind grains.)

water resources must be tapped for the electricity needed to support growing populations.

Building a Dam

Large dams generally have three uses. The most obvious, to regulate the flow of water downstream, is the same reason the North American beaver has leveled trees for the past 1.8 million years. (See sidebar, page 12: "Beaver Dams.") This is especially useful for controlling the unpredictable flooding of large rivers. The other two uses occur upstream of the dam, where the blocked water pools into at least one large reservoir. Once contained, the water can be used to generate electricity (See sidebar, above: "Hydropower") or siphoned into canals that irrigate the region's crops and provide drinking water to nearby cities.

Dam engineers begin every project by surveying the region to determine the optimal combination of materials and design. Dams fall into three major types: earth-filled, rock-filled and concrete, with each relying on the strength of its own materials to hold back the weight of the water. To choose which one, "the first thing you look at is material availability," Ditchey says. If a sufficient amount of earth or rock material is available close to the dam site, then it's usually cheaper to make a dam out of those materials. If not, then concrete is the better choice.

The first step in construction is diverting the river, usually through a temporary pipe or channel, leaving a dry riverbed upon which the dam can be built. Often used is a cofferdam, a temporary structure similar to a retaining wall that's made of wood, concrete or steel sheet piling.

Next, the dry riverbed must be turned into a solid foundation. This requires filling in of any pockets of "weak" material (like most types of soil) with "dental" concrete, much like a dentist fills in a cavity. Then comes "grouting," a form of waterproofing. To grout, engineers will drill extremely deep holes into the foundation, and then fill them with a slurry mixture of cement and water, called cement grout. "The grout is pumped in under pressure," Ditchey explains, "so that it spreads out into the surrounding soil or rock, forming what we call a 'curtain.'"

The grout curtain is the most common way of preventing seepage in a dam foundation. Engineers and geologists working on the project advise on how far apart the holes should be, as well as the angle at which they should be drilled into the foundation so as to intersect as many open cracks as possible.

Dams often take years to construct and employ hundreds of laborers.

With a strong foundation in place, the rest of the dam can be built safely on top, usually by hauling and dumping earth, rock or cement to form a massive wall. Regardless of the material used for filling the dam, "they're all constructed more or less the same way," Ditchey says. That is, if you looked at a cross-section of a dam sliced down the middle, he explains, it would be trapezoidal, with a broad base that slopes up on both sides to a narrower top. The layers of material are laid in 1.5-foot-thick "wires," Ditchey says, "like stacked pancakes."

Once the wall is up and sturdy, the diversion tunnel is closed and water begins to fill the new dam's reservoir.

But since dam projects can take years, engineers also have to worry about what to do if river flooding—that is, more than the diversion tunnel can handle—occurs while the dam is under construction. First, planners check rainfall records to make sure that dam construction in the lowest riverbed area takes place during the driest season. But even in the unlikely event that a flood does occur during this time, the dam's face is covered in steel mesh that will prevent the rushing waters from eroding the rock, soil or cement material that's filling in the wall.

What's the total cost of all this work? Ditchey says it's very much dependent on the size of the dam. "There's no rule of thumb," he says, though labor and materials each make up about half the cost. So for a large dam a couple of hundred feet high, he estimates, "You're talking about tens of millions of dollars, sometimes hundreds of millions," or in the case of Three Gorges, tens of billions of dollars.

Dixon in Dams

The following Dixon products are used in dam construction:

- Air King
- Boss Couplings (stems, clamps, swaged)
- King Combination Nipples
- Suction Couplings
- Air Hammer Couplings
- Concrete Placement (IX) Fittings
- Ball Valves
- FRLs
- Air Receiver Manifold
- King Safety Cable
- Safety Check Valves
- Holedall Swaged Couplings
- In-Line Lubricators

When a Dam Fails

A dam can fail even after it's been running for years, or even decades. An exceptionally large flood could overflow its reservoir. An earthquake could shake up its foundation, as could seepage coming through from unseen cracks deep underground. Dam failure not only shuts down operations, but can be extremely dangerous to nearby residents.

The majority of dams are small, privately owned (around 70 percent of all U.S. dams), and not revenue-generating, according to civil engineer Brad Iarossi, chairman of the Legislative Committee of the Association of State Dam Safety Officials. Fifty years ago, when most dams were built, there was no development to worry about downstream. But over the years, as homes cropped up downstream, dam owners were suddenly met with stricter (and more expensive) flooding and safety rules. "Many, many dams don't make any money," Iarossi explains. "Their owners are often hard-pressed to find the money to invest in routine maintenance operations."

Dam maintenance is so expensive, he explains, because it "often means reconstructing a good portion of the original dam"—including "armoring" the dam with an extra layer of concrete, and diverting the water through a temporary structure while the original is completely drained. Even dams owned by small towns or counties are often too expensive to maintain.

Even more troubling, Iarossi—who also works on the American Society of Civil Engineers' annual rating of civil infrastructure, including dams—says the number of unsafe dams seems to be on the rise. "It isn't keeping pace with the number that are repaired," he says.

The Association of State Dam Safety Officials is now backing congressional legislation that would allot $200 million of federal funds over five years for such repairs. Iarossi is optimistic that the bill will pass and that "states will see that they also have a responsibility to come up with their own funding programs."

By the Numbers:

World's Largest Dams

UC= Under Construction

Rank	Location/Country	Volume of Construction Materials (Thousands of cubic meters)	Year Complete
1	Three Gorges, China	39,300,000	UC
2	Syncrude Tailings, Canada	540,000	UC
3	Chapetón, Argentina	296,200	UC
4	Pati, Argentina	238,180	UC
5	New Cornelia Tailings, Arizona (U.S.)	209,500	1973
6	Tarbela, Pakistan	121,720	1976
7	Kambaratinsk, Kyrgyzstan	112,200	UC
8	Fort Peck, Montana (U.S.)	96,049	1940
9	Lower Usuma, Nigeria	93,000	1940
10	Cipasang, Indonesia	90,000	UC
11	Atatürk, Turkey	84,500	1990
12	Yacyretá-Apipe, Paraguay/ Argentina	81,000	1998
13	Guri (Raúl Leoni), Venezuela	78,000	1986
14	Rogun, Tajikistan	75,500	1985
15	Oahe, South Dakota (U.S.)	70,339	1963
16	Mangla, Pakistan	65,651	1967
17	Gardiner, Canada	65,440	1968
18	Afsluitdijk, Netherlands	63,400	1932
19	Oroville, California (U.S.)	59,639	1968
20	San Luis, California (U.S.)	59,405	1967

West Point Dam across the Chattahoochee River at the Georgia/Alabama border.

THE INVENTOR OF DYNAMITE LEFT A LEGACY OF PEACE

Alfred Nobel was determined to be remembered for more than his destructive invention

By Sue DePasquale

"Justice is to be found only in the imagination."
—Alfred Nobel

A grief-stricken Alfred Nobel was toiling in his laboratory in Sevran, France, in the spring of 1888 when he read the chilling words.

"The merchant of death is dead," reported a French newspaper, going on to report, "Dr. Alfred Nobel, who became rich by finding ways to kill more people faster than ever before, died yesterday …."

The obituary was written erroneously. In fact, it was Alfred's beloved brother and business partner, Ludvig, who had died of a heart attack the day earlier, at the age of 57. But for Alfred Nobel, the impact of those words was galvanizing.

By all accounts an extraordinarily brilliant man—scientist, inventor, author and entrepreneur, fluent in five languages and the first person in the world to create an international holding company—Nobel was best known in his lifetime, and beyond, for inventing dynamite. But Nobel saw himself as an inventor first, a lover of ideas, not a "damages maker." The holder of 355 patents, and a man unlucky in love who had neither a wife nor children, Nobel was determined not to leave behind a legacy of violence and destruction.

And so, in late 1895, just a year before his death, he quietly penned a new copy of his last will and testament. Fully contained on a single page, it outlined how his considerable fortune should be dispersed. Only a small amount would go to his extended family and close associates. The vast remainder would be awarded each year, in perpetuity, as prizes to "those persons who … have rendered the greatest services to mankind," in physics, chemistry, physiology or medicine, literature and—perhaps most notably—peace.

Visionary as he was, even Alfred Nobel could not have imagined the vast and far-reaching impact his prizes would have.

When Alfred Nobel came into the world on October 21, 1833, in Stockholm, Sweden, his parents were in financial crisis. His father, Immanuel, a successful inventor and building contractor with several patents already to his name, had recently suffered a series of business setbacks and the young family's house had burned to the ground the preceding December.

Immanuel and his wife, Andriette, struggled through, declaring bankruptcy and settling into a simple apartment. Little Alfred, who joined brothers Robert and Ludvig, was so frail at birth he almost died. This ill health would follow him into adulthood, contributing to a lifelong sense of isolation—of remaining, in his own words, a "pensive looker-on."

When Immanuel, facing debtor's prison, left to pursue a business opportunity in St. Petersburg, Russia, Andriette soldiered on, working nonstop from dawn 'til after dark to keep her three young sons fed and clothed—and enrolled in school, where the boys, particularly Alfred, excelled in their studies.

After nearly five years of separation (beginning when Alfred was 4), Immanuel finally called for his family in 1842. The Swede had managed to become one of Russia's most-sought-after engineers, transforming the weapons industry with his advances in land and sea mines. The newly reunited Nobels settled happily into life in cosmopolitan St. Petersburg. Now prosperous, the Nobel sons (youngest Emil was born a year after their arrival) were educated not at school, but by university-level tutors who came right to their home.

It quickly became obvious that Alfred was exceptionally intelligent. With his quick mind and far-ranging intellect, he excelled at chemistry, wrestled adeptly with politics and philosophy, and mastered foreign languages (Russian, German, English and French) with ease. "To spend an hour chatting with him was both a remarkable joy and a challenging exercise, because you had to stay on your toes to follow the wild sallies of his unexpected turns of thought and startling paradoxes," colleague Ragnar Sohlman would say many years later.

An insatiable reader, Alfred briefly considered pursuing life as a writer (his four-part prose tragedy *Nemesis* would be published in Sweden more than a century after his death). But his more pragmatic father quickly squashed the idea. In part to make up for dashing Alfred's writing dreams, Immanuel financed a study trip to America in 1850, when the boy turned 17. There, Alfred served an apprenticeship with John Ericsson. The widely admired inventor—and fellow Swede—had recently achieved advances in developing heat engines.

Alfred returned home to Russia after the apprenticeship to join the family's rapidly growing foundry business, which could hardly keep up with the defense industry's requests for weapons. But the end of the Crimean War in 1856 meant an overnight change in fortune. Facing bankruptcy again after the defense money dried up, Immanuel and Andriette left the high society life of St. Petersburg and returned to Sweden, settling into a small home in Stockholm.

It was during these next few years that Alfred became almost obsessed with figuring out a safe way to manufacture and detonate nitroglycerin, a highly explosive liquid substance that had been discovered nearly two decades earlier by Ascanio Sobrero. A few drops placed on an anvil, then hit with a hammer, resulted in "a report as from a pistol shot," Alfred noted with awe. He immediately recognized the substance's potential (for everything from mining to communication systems to weaponry) and began a round of endless—and very risky—experiments.

His big breakthrough came in 1862 when he hit upon mixing the substance with black gunpowder, then lighting it with a fuse. The result: an explosion considerably more powerful than gunpowder alone.

But controlling the explosion remained a major challenge. The potential for disaster became tragically clear on September 3, 1864, when a powerful explosion ripped through the family-owned factory in Heleneborg, where Alfred, brother Emil, and others had been conducting experiments. Emil and four others died in the explosion.

Devastated by the loss of his youngest son, Immanuel suffered a crippling stroke a month later—and remained severely impaired until his death eight years later. Other accidents would follow over the next few years—notably an explosion in Alfred Nobel's German factory—and the tide of public opinion turned against the young inventor, with editorials in U.S. newspapers excoriating him as a "trafficker in death."

But Nobel refused to be deterred in his attempt to tame nitroglycerin. And he was pragmatic. "Nobody should expect," he said, "that an efficient blasting substance will become available to the general public without loss of lives." He became an ambassador, testifying before the U.S. Congress to defend his work and extol the explosive's potential.

Nobel's persistence—and ingenuity—paid off. First he developed the "initial igniter," later known as the "blasting cap." It took the form of a small copper capsule, which he filled with a highly explosive material (mercury fulminate), before adding a quick-match fuse cord. The exploding cap pushed a pressure wave through the attached nitroglycerin, quickly heating and detonating it. "This simple but revolu-

Nobel Prize winners from the 20th and 21st century, left to right: Doris Lessing, Literature 2007; Gerhard Ertl, Chemistry 2007 for his studies of chemical processes on solid surfaces; Mother Teresa, Peace 1979; Albert Fert, Physics 2007 for the discovery of giant magnetoresistance (jointly with Peter Grünberg); Selman Waksman, Medicine 1952 for his discovery of streptomycin.

tionary invention opened the door to make the practical use of all new explosive substances possible," notes author Kenne Fante in *Alfred Nobel: A Biography*.

With the detonation problem solved, Nobel turned to finding a safer way to manufacture and transport his "blasting oil." The solution, after much experimentation: mix three parts nitroglycerin with one part kieselguhr, an inert, absorptive substance found along the banks of Germany's Elbe River. In the Swedish patent for his new product, dated September 19, 1866, he dubbed it "Dynamite or Nobel's Safety Powder."

With these breakthroughs, and Alfred Nobel's unmatched entrepreneurial skills, the industrialist's fortunes were made. He became widely known as the "Dynamite King," filing patents in country after country, building factories around the world—and a business empire that would eventually make him one of Europe's richest men.

But Nobel wasn't one to rest on his laurels. Ever the scientist, he doggedly continued his experiments (His credo: "If I come up with 300 ideas in a year, and only one of them is useful, I am content,") and, a decade later, bested the explosive power of dynamite with "blasting gelatin"—nitroglycerin mixed with the transparent, jelly-like guncotton. His next great discovery came in the mid-1880s with the invention of ballistite. The slow burning gunpowder (combining nitroglycerin, nitrocellulose and camphor) was virtually smokeless. The discovery made possible huge advances in the munitions industry, significantly improving the explosive power of artillery pieces and shells.

By the time he reached middle age, Alfred Nobel was wealthy almost beyond measure. His business dealings had him traveling constantly. He was a much-sought-after (though reluctant) dinner guest, a lover of fine horses, and a friend to influential thinkers of the day, including Victor Hugo, who dubbed him "Europe's richest vagabond."

Despite his great success in business, Nobel was a melancholy man. He described his existence as "half a life," and despairingly called himself "a nomadic condemned by fate to be a broken shipwreck in life." His severe headaches and digestive problems made him cranky. He found dealing with people tiresome, so he spent long hours instead in his lab and at his desk, keeping up with a never-ending load of business correspondence.

Protecting his financial interests around the world required a dogged energy (patent disputes were many over the years), not to mention a written fluency in many languages. Since finding an assistant with the necessary skills was almost impossible, Nobel ended up working himself to the brink of exhaustion.

Love did come to him eventually, at age 43, but it was short-lived. Smitten by the charming and intelligent Bertha Kinsky, who had traveled to Paris in spring 1876 to serve as his secretary, he soon asked whether her "heart" was "free." The answer was no. She left within weeks to marry her longtime love, the young baron Arthur von Suttner. Though the romantic connection between Alfred and Bertha was severed, their friendship endured until his death. Bertha von Suttner, author of *Lay Down Your Arms!*, went on to become an influential peace advocate, earning the Nobel Peace Prize in 1905. Her deeply held convictions—shared with him in correspondence and visits—undoubtedly influenced Nobel's decision to include the cause for peace in his will.

A few months after Bertha's marriage, Alfred took up with a local flower girl named Sofie Hess, more than two decades his junior. Their painful on-again, off-again relationship stretched on for 18 years, with Hess continually taking advantage of Alfred's generosity.

By the time he reached his 60s, with his health failing, the father of dynamite's thoughts turned to the legacy he would leave behind. In the years after brother Ludvig's passing, he rethought earlier versions of his will. On November 27, 1895, he signed the final version that left the bulk of his estate—valued at $5.2 million in 1896 ($250 million today)—to establish the Nobel prizes, stipulating that they were to be awarded "without regard to nationality."

Almost before the ink had dried, he shared news of the will's revised contents with an overjoyed Bertha von Suttner. No doubt, he was reassured by her reaction: "Whether or not I am still alive by then does not matter," she wrote. "What you and I have given will live on."

Alfred Nobel suffered a stroke and died, in San Remo, Italy, on December 10, 1896. Each year, as Bertha predicted, when the Nobel prizes are awarded in Stockholm and Oslo on the anniversary of his death, the world bears witness to his dream.

the Homestead Act and the Real Heroes of the American West

by Eugene Finerman

HOLLYWOOD MOVIES have created our image of the American West: a lawless land tamed by the six-shooter. Yes, the prospector and the cowboy were part of the saga, but the West really was won by the farmer. The plow did more than the gun to settle and build the West, literally breaking the ground that turned wilderness into farmland. Venturing into the Great Plains, where the prairie grass grew as high as 6 feet, those first farmers—*sodbusters*—had been drawn not just by the hope of a better life on the frontier. They had a guarantee from the federal government: free land to anyone who would farm it for five years. That guarantee was the Homestead Act of 1862.

Rec'd 21 May   Public 64

H.R. 125

Thirty-seventh

Congress of the United States,

At the Second Session

BEGUN AND HELD AT THE CITY OF WASHINGTON

in the District of Columbia

on Monday the second day of December one thousand eight hundred and sixty-one

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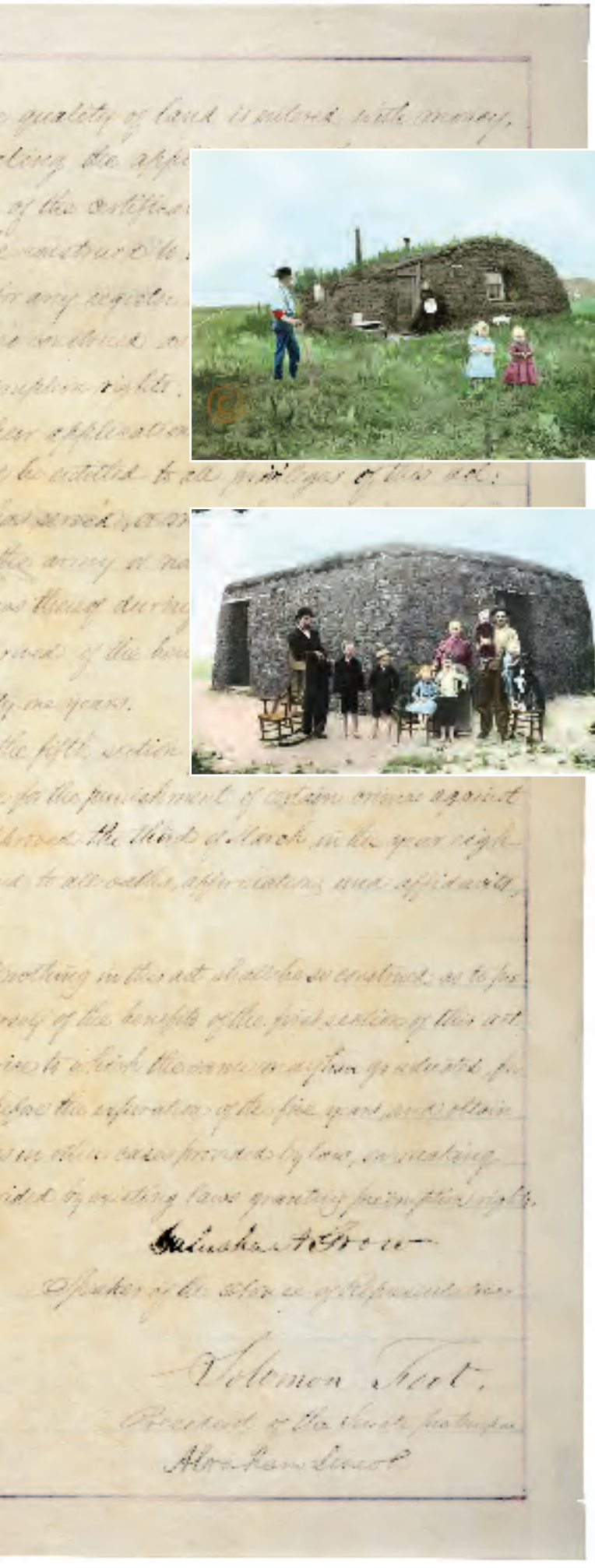
AN ACT to secure homesteads to actual settlers on the public domain.

Be it Enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That any person who is the head of a family, or who has arrived at the age of twenty-one years, and is a citizen of the United States, or who shall have filed his declaration of intention to become such, as required by the naturalization laws of the United States, and who has never borne arms against the United States Government or given aid and comfort to its enemies, shall, from and after the first January, eighteen hundred and sixty-three, be entitled to enter one quarter section or a less quantity of unappropriated public lands, upon which said person may have filed a preemption claim, or which may, at the time the application is made, be subject to preemption at one dollar and twenty-five cents, or less, per acre; or eighty acres or less of such unappropriated lands, at two dollars and fifty cents per acre, to be located in a body, in conformity to the legal subdivisions of the public lands, and after the same shall have been surveyed: Provided, That any person owning and residing on land may, under the provisions of this act, enter other land lying contiguous to his or her said land, which shall not, with the land so already owned and occupied, exceed in the aggregate one hundred and sixty acres.

Sec. 2. And be it further enacted, That the person applying



One-room houses constructed of sod bricks cut from the prairie floor became home for many settler families. Just 12 feet by 14 feet, the houses kept entire families protected from the prairie's harsh elements in the most practical manner.

Although the American Indian tribes disagreed, the federal government had title to the Great Plains, the territory extending in the Midwest from the Mississippi River to the Rocky Mountains, as part of the Louisiana Purchase. But a vast, undeveloped prairie was of no value to an expanding nation. The territory needed to be populated and cultivated, and the government was willing to give land to any adult willing to farm there.

The need for such a policy would seem obvious, but it took a Civil War to enact the legislation. During the 1850s, similar bills had been proposed in Congress and passed by the House of Representatives. In the Senate, however, the proposals were defeated by Southern opposition.

There was a political calculus to this: the South feared that the Western territories, once sufficiently populated to qualify for statehood, would enter the Union as states opposed to slavery. The South had a smaller population than the North (12 million vs. 18 million), a disparity evident in the demographically proportioned House of Representatives. However, the Senate's composition was based on the number of states, and the slave states had a rough parity with the free states: 15 versus 18. New states might tilt that balance, so the South opposed any legislation that promoted Western settlement.

But in 1862, the Civil War made the South conspicuously absent from the U.S. Congress. The Homestead Act finally passed and was signed by President Abraham Lincoln on May 20. The act permitted any U.S. citizen to acquire 160 acres of land in the public domain. The applicant would need to file a claim at the nearest government land office and pay a registration fee of $10 (about $207 in today's dollars).

Within six months of the application, the settler had to establish residency on the property. After five years of farming the land, the settler would be granted the deed of ownership. On January 1, 1863, the first day of the Homestead Act, 418 people filed their applications.

The land was free but not effortless. Just getting to the frontier was a difficult and expensive journey. Settlers traveled by covered wagon; the most common called the Prairie Schooner, a small and sturdy vehicle that could traverse the tall grass of the prairie. Wagon ruts often were the only roads on the frontier. The Prairie Schooner might cost $75, more than $1,500 in today's dollars. Four-feet-wide by 10-to-12-feet-long and a canvas cover that reached 10 feet, that wagon had to hold the settler's family, its essential possessions including farm tools and seed, and at least six months of food.

There were guidebooks at the time, and each prospective settler was recommended to take the following supplies: 150 pounds of flour, 20 pounds of cornmeal, 50 pounds of bacon, 40 pounds of sugar, 10 pounds of coffee, 5 pounds of

salt (to preserve meat) and 15 pounds of beans. Additional meat presumably could be killed along the way. Guns also were a part of that essential inventory.

Everything that could be required had to be taken because the frontier had no convenience stores. The pioneer had to be self-sufficient. Of course, that packed wagon required draft animals to pull it; a team of six oxen or 10 mules would suffice. Adding up the costs of the wagon, the draft team, the farm tools and all the supplies, a settler was likely to have spent $500 to $1,000 in the 1860s, today's equivalent of about $10,000 to $20,000.

Settlers tried to arrive on their claim in the spring, making full use of the growing season and to harvest a crop in the first year of residence. Plowing the soil also provided the farmer with the construction materials for his first home. The Homestead Act required the settler to build a home on the land. However, the common building materials of the East—wood and stone—were not found on the Great Plains. So the prairie itself would provide the building blocks.

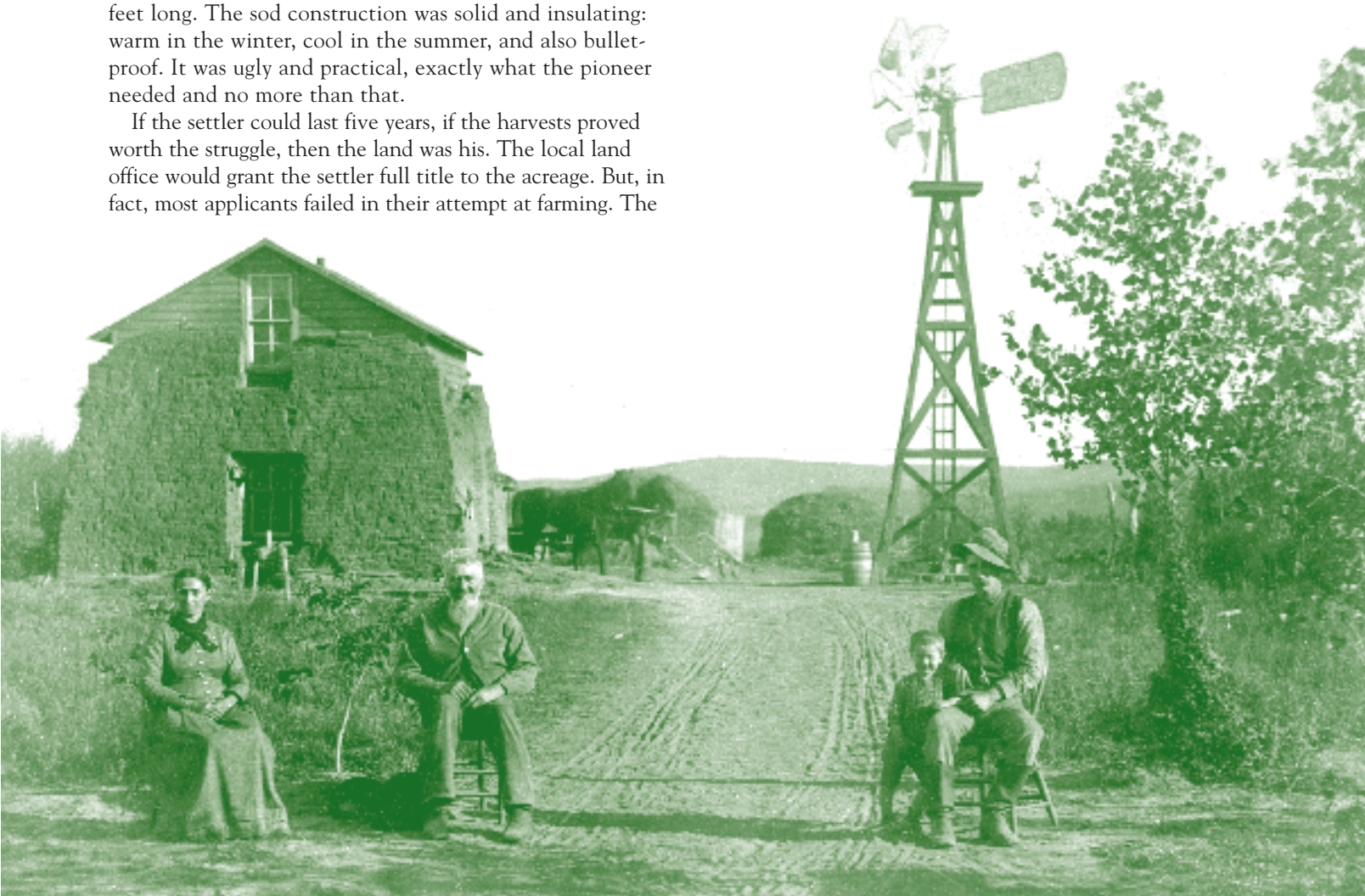
The sodhouse, composed of soil bricks, became the standard home of those early pioneers. Each sod brick was 12 to 18 inches wide by 24 inches long, and weighed about 50 pounds; and the bricks had to be checked to remove any wildlife, especially snakes. It required an acre of sod to build a one-room house just 12 feet wide and 14 feet long. The sod construction was solid and insulating: warm in the winter, cool in the summer, and also bulletproof. It was ugly and practical, exactly what the pioneer needed and no more than that.

If the settler could last five years, if the harvests proved worth the struggle, then the land was his. The local land office would grant the settler full title to the acreage. But, in fact, most applicants failed in their attempt at farming. The land grant records indicated that fewer than half of settlers held on for the required time. Despite that high toll, the Homestead Act was encouraging a Western migration and the settlement of the Great Plains.

In 1860, Nebraska's population was 28,841; by 1870, it was 122,993. Nebraska became a state in 1867. The settlers moved farther west. In 1870, Colorado's population was 39,864; by 1880, it was 194,327. Colorado entered the union in 1876. South Dakota and North Dakota became states in 1889 and Wyoming in 1890. The development of the transcontinental railroad greatly improved travel to the West, but it was the Homestead Act that gave people a reason to go there.

Ten percent of the United States—270 million acres—was settled through the Homestead Act. By 1900, more than 600,000 claims had been filed. The act remained in effect until 1986 encouraging settlement in Alaska, our last frontier. Today, the wagon rut trails of the Great Plains have been paved over by superhighways. The grass prairie now yields crops that feed America and the world. This is the legacy of the Homestead Act and the pioneers who pursued its promise.

** The conversion of 19th-century dollar values to 2006 U.S. dollars (the last date for which figures are available) is calculated based on the Consumer Price Index and relies on the work of economists Lawrence Officer and Samuel H. Williamson at www.MeasuringWorth.com*



An Unknow

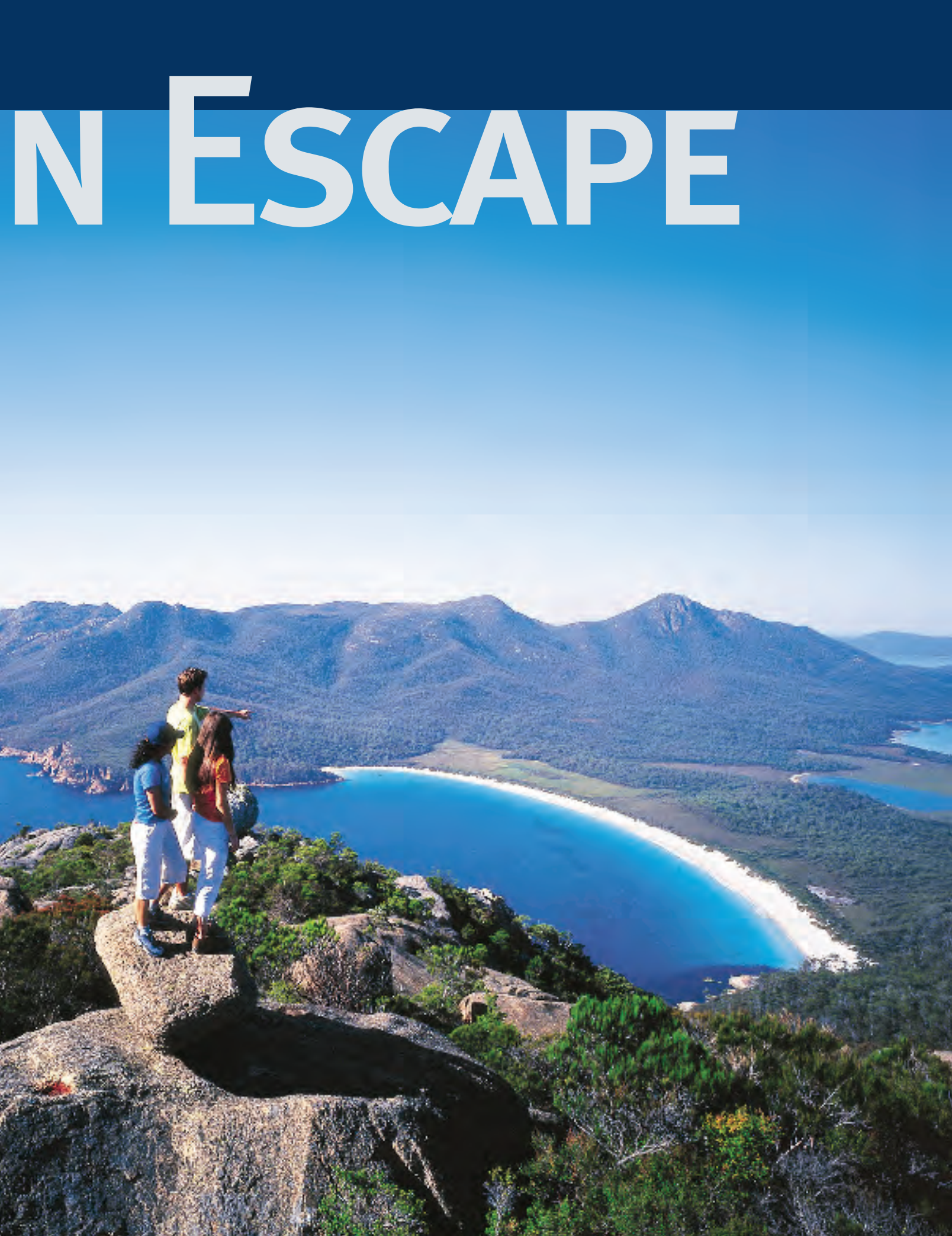
Tasmania's diverse terrain and unique culture entice visitors to explore

The Australian state of Tasmania is a true wilderness escape: a green, beautiful and geographically diverse island that amounts to a boutique shop for the outdoor adventurer. Imagine a place where in one 90-minute drive you can go from near-impenetrable rain forest valleys to Serengeti-like plains, and then from ancient alpine meadows to long white beaches.

Tassie, as the locals call it, sits just 150 miles southeast of mainland Australia, the two separated by the Bass Strait. The heart-shaped island, roughly the size of the Republic of Ireland, is rich in maritime history and features lush green valleys, rugged mountain ranges, uncrowded towns and undeveloped coastlines.

By Greg Rienzi

n Escape



Tasmania is a nature lover's paradise. Hiking opportunities are abundant, whether through Freycinet National Park to overlook Wineglass Bay, pages 24-25, or at Cradle Mountain in Lake St. Clair National Park, above.

Elbow room is certainly not a problem here. The island's population is less than 500,000 and more than 40 percent of Tasmania is protected as World Heritage Area, national parks and reserves. The island's unspoiled beauty is perhaps its greatest resource and Tassies take great pride in having the world's cleanest air and water, which, they are quick to add, has been scientifically proven.

Bushwalking is a national pastime and the island has perhaps the best nature walks in the world. Visitors can expect breathtaking waterfalls, towering sea cliffs, diverse forests and beautiful waterways, with nothing but nature to provide the soundtrack.

"Tasmania offers a chance to get away from it all and experience a true wilderness environment," says Malcolm Griffiths, North American representative of the island's tourism agency. "It's a place that makes you want to get out and adventure, whether it's hiking, cycling, paddling on the coastlines or white-water rafting. There's just countless adventure destinations here and it's the main reason people come."

Tasmania has more than 1,000 mountain peaks and some of the world's rarest animals, such as the Tasmanian devil, the state's icon.

Aboriginal people, who were primarily hunters and gatherers, populated the island throughout most of its history. The first European to explore the island was the Dutch explorer Abel Tasman, who arrived in 1642 and later named the island Van Diemen's Land after the governor of the Dutch East Indies. It was renamed Tasmania in 1856 to honor Tasman and in 1901 became an official state of the new Commonwealth of Australia.

Like its neighbor to the north, Tasmania was also a

Tasmania Facts

PHOTOS COURTESY OF TOURISM TASMANIA

The people: Tasmanians are a friendly, happy and relaxed lot. They love their sport and the outdoors—and what's not to love? You'll soon discover their fondness to abbreviate words and/or end them with an "ie" or "y," e.g. brekky (breakfast), chalkie (teacher) and, of course, Tassie. Be forewarned: you might be doing the same by the end of the stay.

When to go: Tasmania has four mild but distinct seasons, and you can travel to the island year-round. Autumn (March through May) is a favorite of many Tassies for its sunny days and vibrant colors. Perhaps the best time to go is during the summer months, December through March, when you can feel the sun on your back as you stroll the coastline and enjoy peak bushwalking season. If you go then, check out Hobart's Summer Festival, which is highlighted by the famous Taste of Tasmania. The festival also overlaps with the Rolex Sydney-to-Hobart Yacht Race, another signature event.

Keep in mind that the island's climate can vary greatly on any given day, hence the local quip, "If you don't like the weather in Tasmania, wait five minutes."

How to get there: Travel experts recommend flying to either Sydney or Melbourne to connect with a short flight across Bass Strait to Hobart or Launceston. For a more romantic passage, the Spirit of Tasmania offers ferry service between Melbourne and Devonport twice daily.

What to see and do: Plan on staying at least a week to get the most out of your Tasmania experience.

Narawntapu National Park ranks as one of the best places to see animals such as kangaroos, wallabies, pademelons (now extinct on mainland Australia), wombats and, of course, the legendary Tasmanian devil. Look for the devils after sunset and listen for their spine-chilling screeches.

For a one-of-a-kind view, go to Tahune Forest, a beautiful reserve on the banks of the Huon River and home of the popular AirWalk and swinging bridges. The AirWalk is a 600-meter walk above and amongst the trees, the highlight of which is the 60-foot-high cantilever bridge, which offers stunning views of the forest.

All the locals will point you to Cradle Mountain in Lake St. Clair National Park, part of the Tasmanian Wilderness World Heritage Area. Pack your backpack and walk the Overland Track, a well-marked 40-mile trek that takes you past alpine moors, gorges, tall forests and right up to Cradle Mountain.

Less wild but still great fun is Salamanca, an area on Hobart's waterfront lined with a long row of Georgian sandstone warehouses built in the 1830s. The area offers great night life, restaurants and shopping.

For seaside beauty, go to the historic village of Stanley, located in northwest Tasmania and nestled at the base of "The Nut," a sheer-sided bluff that is the remains of an ancient volcanic plug.

To learn more about Tasmania's penal colony past, go to the Port Arthur Historic Site, which has more than 30 buildings, ruins and restored period homes dating from the prison's establishment in 1830 until its closure in 1877.

Where to eat and drink: If you're not already a "foodie," you will be by the time you leave. Thanks in large part to the clean air and water, Tasmania boasts some of the best produce and seafood in the world. Try the Atlantic salmon, rock lobster, oysters, game meats, mushrooms, summer berries, leatherwood honey and any vegetable you fancy. Your taste buds won't know what hit them, and you'll see why the island is called Australia's gourmet state.

Fine restaurants can be found all over the island and seafood is a staple of most menus. In Hobart, check out Mures Upper Deck, Mr. Wooby's (named after a famed area convict), Maldini's (a quaint Italian cafe) and Prossers on the Beach, regarded by many as one of the best seafood restaurants on the island.

If you're on the go, stop by a takeaway shop and order a "burger with the lot," a beef patty traditionally topped with egg, tomato, cheese, bacon, lettuce, onion and barbecue sauce.

Wine lovers rejoice as Tasmania has plenty of fine wines to uncork. Of note, the Tamar Valley Wine Route, which follows the Tamar River from Launceston to Bass Strait, offers top-tier wineries in scenic settings. Unlike the mainland where Shiraz is king, the Tasmanian climate favors grapes such as Pinot Gris, Pinot Noir and Chardonnay.

Where to stay: Major chain hotels are relatively new to Tasmania, so what you will find are an assortment of very personal, unique and quality accommodations. At the top end of the spectrum are the Islington Hotel and the Henry Jones Art Hotel, both in Hobart. The Islington, a Regency-style hotel built in 1847, is relatively small but luxurious, and offers spectacular views of Mount Wellington. A relative newcomer is the award-winning Henry Jones, billed as Australia's first and only dedicated art hotel. The hotel's suites, foyers, bars and restaurants are furnished with more than 250 original artworks, most created by students from the nearby Tasmanian School of Art.

If you're looking for a base camp for outdoor adventures, a good bet is the Cradle Mountain Lodge, nestled high in the Tasmanian wilderness. The lodge features fine food and wine, day trip activities and 86 timber cabins, some with hot tubs and fireplaces. On the northern coast, the Beachside Retreat West Inlet gets top marks and guests rave about its secluded beach, views and friendly service.

Back in Hobart, the bed and breakfast industry is alive and well, and you need look no further than the historic village of Battery Point, a lovely part of town and a 10-minute walk to most of the city's attractions.

Tasmania: Tips from a Local

Early one summer morning, marine scientist Peter Nichols and a student wade out into the shallows of one of Tasmania's many pristine estuaries. They were there to learn but took a moment to hunt in the crystal-clear waters of Safety Cove for abalone, a prized shellfish Tasmania is famous for. Nichols also wanted to capture the moment for his student.

"I told him to just look around and take it all in: the horizon, the water, the shoreline. How lucky are we to be surrounded by all this natural beauty? There is just something wonderful about all this," says Nichols, a native of Melbourne who came to Tasmania in 1986 for a five-year contractual job.

The island's natural beauty is why he never left, he says. Here are some of his favorite spots.

He suggests a drive to Sheffield, a quaint town on the northwest coast famous for the murals painted on the sides of its buildings—and even "rubbish bins"—that offer a visual history of the area. Drop by one of the town's traditional Australian pubs for a beer and a "counter meal," Tasmanian for pub food. You're in the north, so ask for a pint of James Boag's.

Sheffield is also a gateway to Cradle Mountain and picturesque Lake Barrington, a popular recreation spot and the site of the world rowing championships in 1990. If you're lucky enough to be there during regatta time, he says, don't miss the races.

"It is one of the more spectacular rowing venues in the world," he says.

Water lovers, he says, need to visit Coles Bay, roughly a three-hour drive from Hobart. Coles Bay sits at the foot of granite mountains known as the Hazards and on the edge of the world-renowned Freycinet National Park. Here you can fish, sail, swim, kayak, snorkel, rock climb, bushwalk or just take in the spectacular coastal scenery.

Nearby is the iconic Wineglass Bay, a perfect crescent of white sand beach set off by the stunning turquoise water. The best way to approach the bay is from a trail that starts at Freycinet. Halfway along the trail stands a peak that offers an amazing view of the bay and valley, he says. "The waters provide beautiful, clean snorkeling or diving, with an abundance of marine life to be seen."

The more adventurous can tackle the South Coast Track, known as one of the world's great wilderness walks. Most people take about six to eight days to complete the challenging trail, which depending on the time of year, is prone to harsh weather conditions. A popular way to do this walk is to fly into Melalueca and then walk out to Cockle Creek. The trail includes beach treks, the Prion Beach boat crossing, grassy hills, the rugged Ironbound range and "a number of beautiful inlets that make wonderful overnight camping stops."

Nichols says the effort is well worth the unspoiled, civilization-free beaches, lagoons and majestic mountains.

Speaking of mountains, he recommends a hike to the top of Mount Wellington, which overlooks Hobart. Nearby is Tasmanian Devil Park and Bonorong Wildlife Conservation Park where, in addition to the Tassie devil, you might see kangaroos, wallabies, emus, koalas, kookaburras, possums and many more unique native species.

If you want to have fun getting lost, Nichols says to head to Westbury Maze, a hedge maze in historic Westbury in northern Tasmania. It features 3,000 neatly clipped bushes and a network of pathways more than a kilometer long. Don't underestimate the challenge, he warns. "I got stuck in there once with my daughters."

Once you do get out, enjoy some refreshments or a light meal in the famous Tea Room, with its formal garden courtyard.

When you're tired from all the walking and want to unwind, Nichols says the quintessential Tasmanian town of New Norfolk on the Derwent River makes the perfect getaway. Tour the historic buildings there—in particular the old Oast houses (used for drying hops)—or sit on the riverbank and just savor the beauty of Tasmania.

Bustling Hobart, left and right, is Tasmania's capital city and cultural center. It attracts visitors and residents to its restaurants, night life and busy arts scene.

PHOTOS COURTESY OF TOURISM TASMANIA

penal colony where those brought to justice under the Crown of England lived in harsh conditions. The majority of convicts were sent to Port Arthur on the island's Tasman Peninsula, which is now an area of farms, forests, sheer cliffs and the world's southern-most historic prison. In fact, the Port Arthur Historic Site offers tourists an opportunity to stroll back 150 years and explore a prison once feared and reviled.

The island's top three destinations and largest cities are Hobart, Launceston and Devonport.

Hobart, the island's capital, is also the cultural center of Tasmania and the best place for night life. The historic harbor town on the island's southern tip is famous for its 19th-century waterfront warehouses that now house cafes, restaurants and studios that bustle with visitors. Hobart also has a busy arts scene, highlighted by the Tasmania Symphony Orchestra and the Salamanca Arts Centre. The active harbor also boasts many tour boats and fishing charters.

Launceston in the north is the gateway to the Tamar Valley, where you can drive past rolling fields that in the springtime come alive with color. The Tamar Valley is also home to one of the island's four wine trails, an inspiration for more outdoor adventures.

Farther west is Devonport, which sits on the banks of the Mersey River and is home to the Spirit of Tasmania ferries that make regular trips to Melbourne. Devonport also beckons you to go inland and explore the many national parks located directly south.

Griffiths says that when you want to take a break from all your adventures, you can enjoy the island's many spas and some of the best food and wine on the planet.

"I tell people that Tasmania is somewhere you can expect to get your feet dirty by day and pampered by night," he says.

The best part? Nothing is more than three hours away.

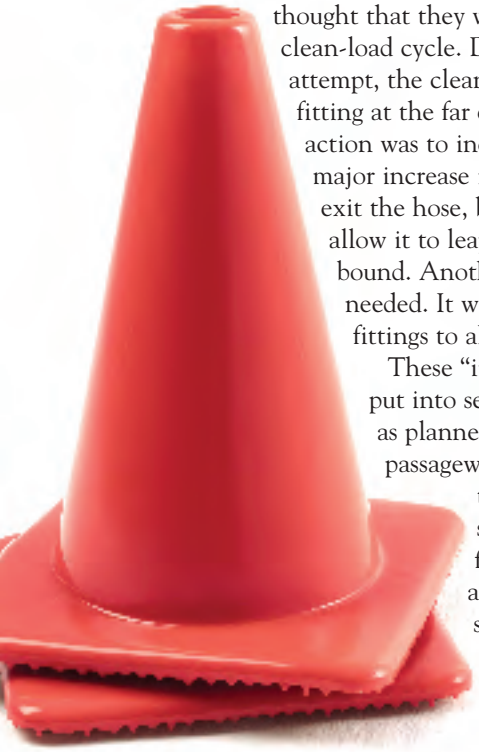
Warning! There are No Shortcuts to Safety

By Phil Kimble

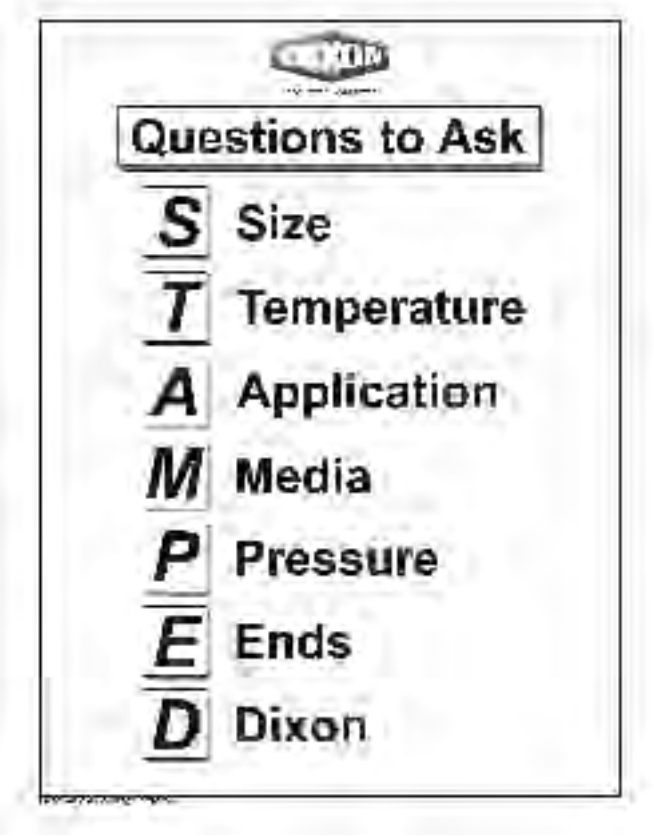
No matter how stern the warning, we are sometimes blind to the consequences. Even with a manufacturer's warning, productivity is often of greater importance than safety. Until someone gets severely injured.

A typical petroleum distribution center uses the same hose assemblies to load all of its products. When the loading process is complete, the hose is uncoupled from the pump and a cleaning plug, otherwise known as a "pig," is inserted into one end. The end is then capped and slightly pressurized with air. The air pressure makes the "pig" travel the length of the assembly and come out the other end. This removes any residual product from the interior of the hose to prevent contamination of the next product to be loaded.

One such distribution center decided that it would use aluminum cam and groove couplings in its loading hoses. Because they are lightweight and easy to connect, it was thought that they would speed up the load-clean-load cycle. During the first "pigging" attempt, the cleaning plug got stuck at the fitting at the far end. The first course of action was to increase air pressure. After a major increase in pressure, the "pig" did exit the hose, but at a velocity that would allow it to leap tall buildings in a single bound. Another course of action was needed. It was decided to bore out the fittings to allow easier passage.



These "improved" assemblies were put into service, but all was not going as planned. Even with the improved passageway, the "pig" still lodged in the fitting unless the pressure was increased to levels far beyond what anyone anticipated would be necessary. The couplings were also breaking frequently. During a routine visit by the distributor salesman, the reason for his increased sales of aluminum cam and groove couplings was uncovered.



The salesman contacted the coupling manufacturer. Together they met with the plant manager and safety director. Even after a stern written warning from the coupling manufacturer detailing potential catastrophic events, bored out aluminum cam and groove couplings remained in service. The plant manager's rationale was that these couplings made the job easier for his workers and only one fitting broke when it was dropped on the concrete floor. The one that broke while loading product did result in a spill, but it was not deemed significant enough to change the process.

Later, during a routine "pigging" operation, a worker from another department inadvertently walked into the area just as the assembly was pressurized. The worker was only a few feet away when the "pig" slammed into the fitting making it explode like a grenade. He received multiple shrapnel wounds, and the hose whipped, striking his head, breaking his jaw, and puncturing one eardrum. He was in a coma for almost a month and spent the next four months in the hospital.

When manufacturers issue warnings about their products, they do it for a purpose. Disregarding those warnings can lead to catastrophic, even deadly, results. "Keep it safe" by heeding manufacturers' notices and warnings. They know their products better than anyone.

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Acupuncture for Healing

The ancient art is a pain remedy for millions

BY SUE DEPASQUALE

Before Embarking on Treatment …

- Be sure to inform all of your health care providers that you are using, or considering using, acupuncture. Ask their opinion about the likelihood of success for your condition or disease.
- Be an informed consumer. Find out what scientific studies have been done on the effectiveness of acupuncture for your health condition.
- Choose a practitioner with care, making sure he or she is licensed. And check in with your insurer to see whether the services will be covered.

SOURCE: National Center for Complementary and Alternative Medicine
http://nccam.nih.gov/health/acupuncture/

Once viewed as a "fringe" therapy with questionable benefits, acupuncture has moved squarely into the mainstream in most industrialized nations, including the United Kingdom, Australia, Canada, and the United States.

Currently, more than 50 percent of the population in these countries report having used some form of complementary medicine during their lives as an alternative or in addition to traditional medicine, according to the World Health Organization. In the United States alone, an estimated 8.2 million people have tried acupuncture at some point, and more than 22,500 people are now licensed to practice the ancient healing art.

Though people turn to acupuncture for a wide variety of ailments—from asthma and hypertension to depression and the debilitating nausea caused by chemotherapy—it's most commonly sought out for the relief of pain, and often after more conventional treatments have failed.

"By the time many people come to us, they have been through multiple layers of the health care system," says licensed acupuncturist David Paton, who has been practicing in Maryland for 15 years. "Because we're often not the first choice, we end up seeing someone for a chronic condition," he adds. Among the most common ailments sending patients for relief: chronic headaches, arthritis and lower back pain.

Acupuncture has its origins in China more than 2,000 years ago, and today remains fully integrated into that nation's health care system. The term describes a family of procedures that stimulate points on the body through a variety of techniques—most commonly through hair-thin, metallic needles.

The placement of these needles is crucial and is based on the philosophy underlying traditional Chinese medicine (TCM). It holds that the body exists in a delicate balance of two inseparable and opposing forces—the *yin* (cold, slow or passive principle) and the *yang* (hot, excited, active principle).

Ill health points to the body being thrown out of balance, according to TCM, indicating blockage of the flow of *chi* (vital energy; pronounced *chee*) along the body's 12 main "meridians" and eight secondary meridians. The acupuncturist's task: to bring the body back into balance by stimulating some combination of the 2,000-plus acupuncture points connecting these meridians.

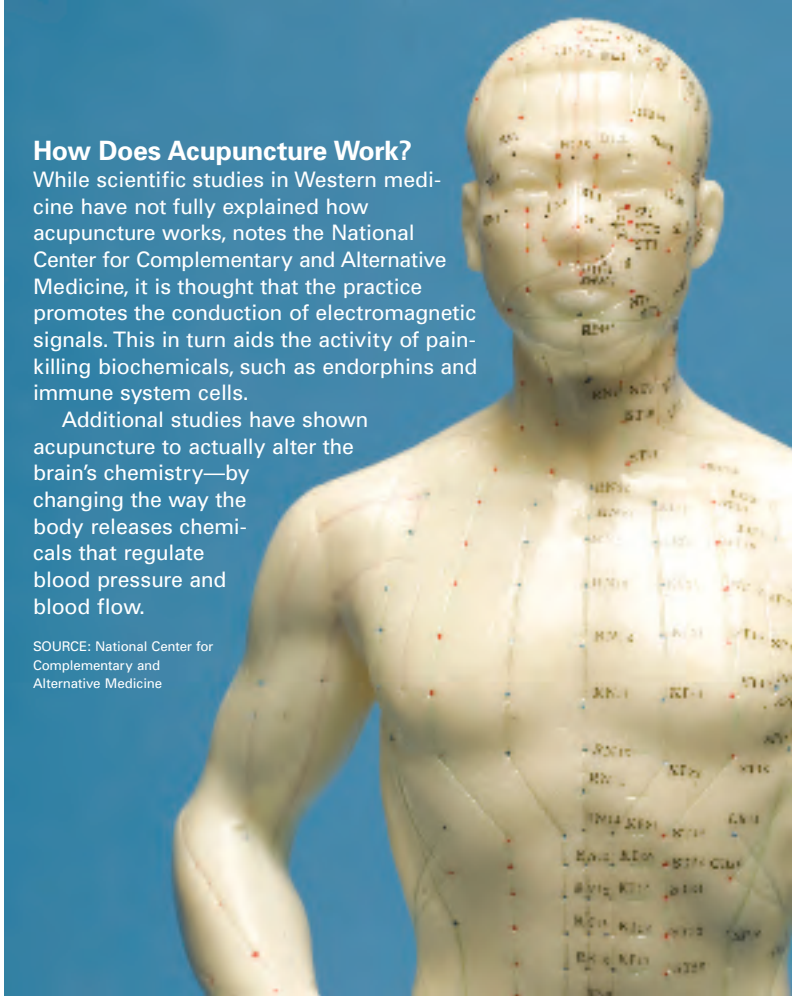
While it is difficult to generalize about a "typical" course of treatment, says Paton, patients often begin on a weekly basis, while some traditions call for multiple sessions for several weeks. On average, an individual session lasts 45 to 60 minutes. Administered correctly, the sterilized acupuncture needles cause no or minimal pain. While some people report feeling a sense of relaxation during the treatment, others experience a "tingling" sensation and an overall feeling of being energized.

"Within six to eight treatments, you should be able to experience changes," Paton says. Many, though not all, people report reduction in their acute pain, and improvement in other areas of wellness—better sleep, less fatigue, he says. Chronic conditions take longer to remedy (after all, they've had years to develop) and often require a long-term treatment plan.

"While people often first come to see an acupuncturist for pain, the effects of acupuncture often reduce the impact of tension in your life," notes Paton, who is dean of students at Tai Sophia Institute, a graduate school for the healing arts, the first accredited acupuncture program in the United States, established in 1981 and based in Columbia, Md.

Constant stress—brought on by punishing deadlines, financial worries and work/family conflicts—can interfere with the body's ability to repair itself at the cellular level, setting off a cascade of ever worsening health problems. The holistic approach to good health (treatment of the whole person as opposed to just the specific ailment) that Tai Sophia Institute and other acupuncture programs advocate calls for taking steps to reduce that daily stress and for using acupuncture to "harmonize the flow of *chi*" so that the body's "natural healing tendencies are accelerated or maximized," explains Paton.

"Eventually," he adds, "acupuncture and related holistic wellness practices may become part of the maintenance [plan] of one's health, much like brushing your teeth."



How Does Acupuncture Work?

While scientific studies in Western medicine have not fully explained how acupuncture works, notes the National Center for Complementary and Alternative Medicine, it is thought that the practice promotes the conduction of electromagnetic signals. This in turn aids the activity of pain-killing biochemicals, such as endorphins and immune system cells.

Additional studies have shown acupuncture to actually alter the brain's chemistry—by changing the way the body releases chemicals that regulate blood pressure and blood flow.

SOURCE: National Center for Complementary and Alternative Medicine

The Revolution of Radar

A weapon of war became a ubiquitous tool

By Virginia Hughes

In the late summer of 1940, as Nazi forces continued relentless air raids over civilians in London, British physicist "Taffy" Bowen smuggled a small box onto a U.S.-bound ship. In the box was the Royal Army's most prized weapon: radar. Prime Minister Winston Churchill had sent Bowen—and with him, all of the trusted secrets of British technology—because he needed America's help for a last-ditch attempt to choke Germany's momentum. Indeed, the contents of that box would ultimately help turn the war around.

Although the British were worried about the Germans getting the advanced radar technology contained in Bowen's box, it was a German who first discovered radar—a half-century earlier. In 1887, from the comfort of his home laboratory, German physicist Heinrich Hertz figured out that radio waves would reflect off of metals. By 1904, another German scientist, Christian Hülsmeyer, unveiled his "telemobiloscope"—a device that used radio waves to detect large metal ships up to 3 kilometers (2 miles) away.

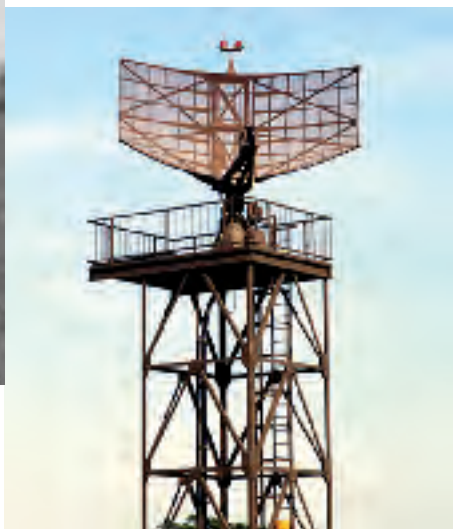
In 1915, British meteorologist Robert Watson-Watt thought that since lightning gives off radio waves, detectors could warn pilots of approaching thunderstorms. Watson-Watt figured out how to detect the signal, and then developed a rotating antenna that, by recording at what position the signal was strongest, could pinpoint the direction of the storm. And 15 years later, as more and more planes were built for radio communication, airport traffic control towers with radio wave detectors slowly began replacing flagmen in control towers. The first in the United States was built in Cleveland, Ohio in 1930. Within five years, there were 20 towers across the country.

It wasn't long before devices called radio detection finders (RDFs) were made that sent out radio pulses and then recorded how long it took for them to bounce back. The devices could calculate the distance and speed of whatever distant objects—notably, ships—were hit by the radio wave. By 1940, the eastern coastline of England was lined with 21 radar towers, all part of the country's national radar defense network, called Chain Home. The towers, though fairly conspicuous, provided early warnings of enemy plane formations across the English Channel. Still, at that point, radar technologies were not able to detect objects with much precision.

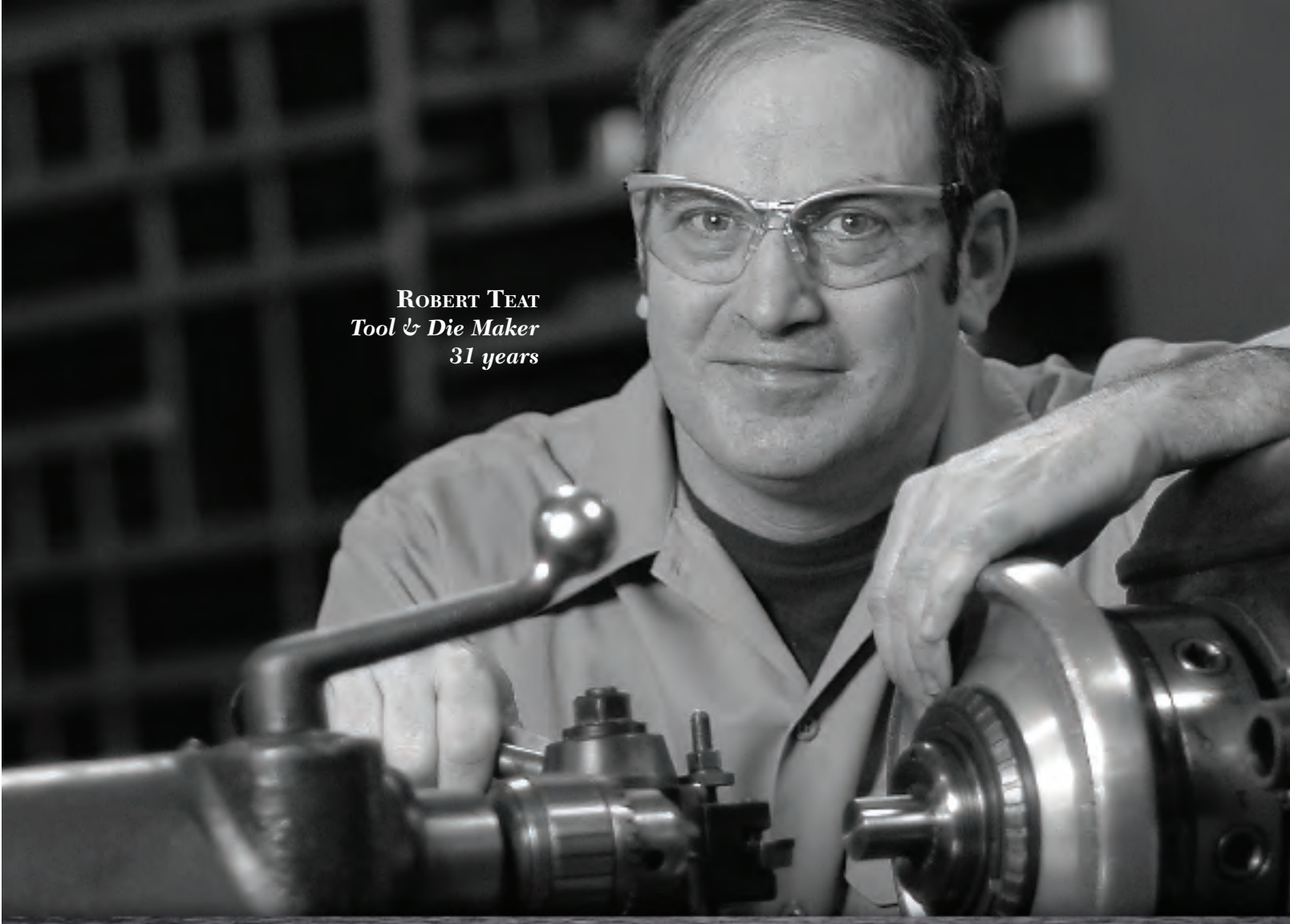
Enter Bowen's box. In it was a copper disk called a resonant cavity magnetron. At that time, radio waves were transmitted at wavelengths as long as 10 meters (33 feet). But the cavity magnetron device generated waves just 10 centimeters long (4 inches), called microwaves. When used as a detection device, this narrower beam was more accurate in pinpointing a target's location. What's more, it could detect much smaller objects, using much smaller (and thus, less noticeable) antennas.

In August 1940, Churchill ordered the first offensive air attacks on Germany. Hitler, underestimating how important it would be to knock out the Brits' radar network, instead issued retaliatory raids on London. That bombing campaign, called the Battle of Britain, was then the largest attempted by Hitler. But thanks to radar, the Royal Air Force put down two German planes for every one of its own lost. The battle was Hitler's first major defeat and a turning point for the rest of the war.

Over the next 60 years, the uses for radar multiplied. From helping to predict the weather to catching highway speeders to tracking the migration patterns of animals, radar has evolved from a weapon of war to a workhorse of modern society.



British meteorologist Robert Watson-Watt, far left, experiments with a kite and a wireless transmitter at Sunnymeads in Berkshire.



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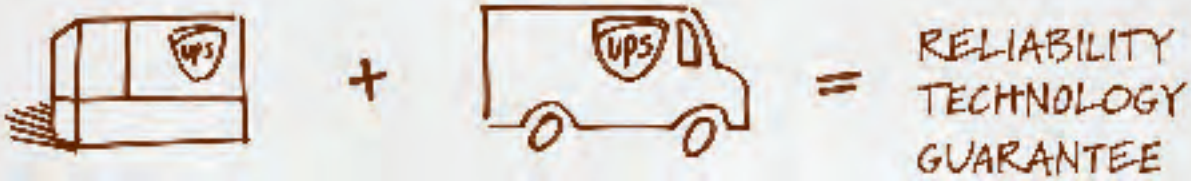

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