The

VICTORIAN INTERNET

Wheatstone, clearing Cooke's debts and valuing their business at a hefty £144,000. In September 1845, Cooke and Ricardo set up the Electrical Telegraph Company, which bought out Cooke and Wheatstone's patent rights altogether.

On both sides of the Atlantic, the electric telegraph was finally taking off.

4.

THE THRILL ELECTRIC

"We are one!" said the nations, and hand met hand,
in a thrill electric from land to land.

—from "The Victory," a poem written in tribute to Samuel Morse, 1872

No invention of modern times has extended its influence so rapidly as that of the electric telegraph," declared *Scientific American* in 1852. "The spread of the telegraph is about as wonderful a thing as the noble invention itself."

The growth of the telegraph network was, in fact, nothing short of explosive; it grew so fast that it was almost impossible to keep track of its size. "No schedule of telegraphic lines can now be relied upon for a month in succession," complained one writer in 1848, "as hundreds of miles may be added in that space of time. It is anticipated

that the whole of the populous parts of the United States will, within two or three years, be covered with net-work like a spider's web."

Enthusiasm had swiftly displaced skepticism. The technology that in 1845 "had been a scarecrow and chimera, began to be treated as a confidential servant," noted a report compiled by the Atlantic and Ohio Telegraph Company in 1849. "Lines of telegraph are no longer experiments," declared the *Weekly Missouri Statesman* in 1850.

Expansion was fastest in the United States, where the only working line at the beginning of 1846 was Morse's experimental line, which ran 40 miles between Washington and Baltimore. Two years later there were approximately 2,000 miles of wire, and by 1850 there were over 12,000 miles operated by twenty different companies. The telegraph industry even merited twelve pages to itself in the 1852 U.S. Census.

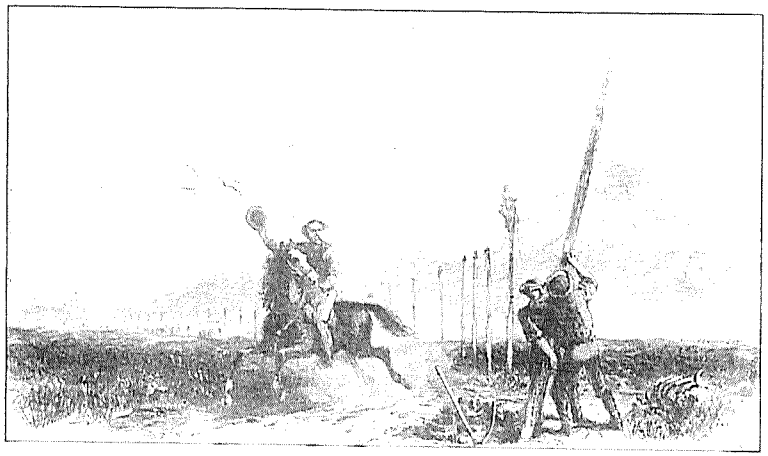
"The telegraph system [in the United States] is carried to a greater extent than in any other part of the world," wrote the superintendent of the Census, "and numerous lines are now in full operation for a net-work over the length and breadth of the land." Eleven separate lines radiated out from New York, where it was not uncommon for some bankers to send and receive six or ten messages each day. Some companies were spending as much as $1,000 a year on telegraphy. By this stage there were over 23,000 miles of line in the United States, with another

10,000 under construction; in the six years between 1846 and 1852 the network had grown 600-fold.

"Telegraphing, in this country, has reached that point, by its great stretch of wires and great facilities for transmission of communications, as to almost rival the mail in the quantity of matter sent over it," wrote Laurence Turnbull in the preface to his 1852 book, *The Electro-Magnetic Telegraph*. Hundreds of messages per day were being sent along the main lines, and this, wrote Turnbull, showed "how important an agent the telegraph has become in the transmission of business communications. It is every day coming more into use, and every day adding to its power to be useful."

Arguably the single most graphic example of the telegraph's superiority over conventional means of delivering messages was to come a few years later, in October 1861, with the completion of the transcontinental telegraph line across the United States to California. Before the line was completed, the only link between East and West was provided by the Pony Express, a mail delivery system involving horse and rider relays. Colorful characters like William "Buffalo Bill" Cody and "Pony Bob" Haslam took about 10 days to carry messages over the 1,800 miles between St. Joseph, Missouri and Sacramento. But as soon as the telegraph line along the route was in place, messages could be sent instantly, and the Pony Express was closed down.

In Britain, where the telegraph was doing well but had



Construction of the transcontinental telegraph along the route of the Pony Express, 1861. When the telegraph line was complete, the horse-and-rider relay service was rendered obsolete.

not been quite so rapidly embraced, there was some bemusement at the enthusiasm with which it had been adopted on the other side of the Atlantic. "The American telegraph, invented by Professor Morse, appears to be far more cosmopolitan in the purposes to which it is applied than our telegraph," remarked one British writer, not without disapproval. "It is employed in transmitting messages to and from bankers, merchants, members of Congress, officers of government, brokers, and police officers; parties who by agreement have to meet each other at the two stations, or have been sent for by one of the parties; items of news, election returns, announcements of deaths, inquiries respecting the health of families and individuals,

daily proceedings of the Senate and the House of Representatives, orders for goods, inquiries respecting the sailing of vessels, proceedings of cases in various courts, summoning of witnesses, messages for express trains, invitations, the receipt of money at one station and its payment at another; for persons requesting the transmission of funds from debtors, consultation of physicians, and messages of every character usually sent by the mail. The confidence in the efficiency of telegraphic communication has now become so complete, that the most important commercial transactions daily transpire by its means between correspondents several hundred miles apart."

Just as the old optical telegraphs were understood to be the preserve of the Royal Navy, the new electric telegraph was associated in British minds with the railways. By 1848, about half of the country's railway tracks had telegraph wires running alongside them. By 1850, there were 2,215 miles of wire in Britain, but it was the following year that things really took off. The domination enjoyed by Ricardo and Cooke's Electric Telegraph Company came to an end as rival companies arrived on the scene, and thirteen telegraph instruments based on a variety of designs were displayed at the Great Exhibition of 1851 in London, fueling further interest in the new technology. These developments gave the nascent industry the jolt it needed to emerge from the shadow of the railways.

The telegraph was doing well in other countries, too. By 1852, there was a network of 1,493 miles of wire in

Prussia, radiating out from Berlin. Turnbull, who compiled a survey of telegraph systems around the world, noted that instead of stringing telegraph wires from poles, "the Prussian method of burying wires beneath the surface protects them from destruction by malice, and makes them less liable to injury by lightning." Austria had 1,053 miles of wire, and Canada 983 miles; there were also electric telegraphs in operation in Tuscany, Saxony and Bavaria, Spain, Russia, and Holland, and networks were being established in Australia, Cuba, and the Valparaiso region of Chile. Competition thrived between the inventors of rival telegraph instruments and signaling codes as networks sprung up in different countries and the technology matured.

Turnbull was pleased to note that the wonders of the telegraph had managed to rouse the "lethargic" inhabitants of India into building a network. He was even ruder about the French, whom he described as "inferior in telegraphic enterprise to most of the other European companies." This view was unfounded, for the French had not only invented the telegraph but named it too. But their lead in the field of optical telegraphy had actually worked against them, and the French were reluctant to abandon the old technology in favor of the new. François Moigno, a French writer, compiled a treatise on the state of the French electric telegraph network, whose size he put at a total of 750 miles in 1852—and which he condemned for leading to the demise of the old optical telegraphs.

Sending and receiving messages—which by the early 1850s had been dubbed "telegrams"—soon became part of everyday life for many people around the world. But because this service was expensive, only the rich could afford to use the network to send trivial messages; most people used the telegraph strictly to convey really urgent news.

Sending a message was a matter of going into the office of one of the telegraph companies and filling in a form giving the postal address of the recipient and a message—expressed as briefly as possible, since messages were charged by the word, as well as by the distance from sender to receiver. Once the message was ready to go, it would be handed to the clerk, who would transmit it up the line.

Telegraph lines radiated out from central telegraph offices in major towns, with each line passing through several local offices, and long-distance wires linking central offices in different towns. Each telegraph office could only communicate with offices on the same spoke of the network, and the central telegraph office at the end of the line. This meant that messages from one office to another on the same spoke could be transmitted directly, but that all other messages had to be telegraphed to the central office and were then retransmitted down another spoke of the network toward their final destination.

Once received at the nearest telegraph office, the mes-

sage was transcribed on a paper slip and taken on foot by a messenger boy directly to the recipient. A reply, if one was given, would then be taken back to the office; some telegraph companies offered special rates for a message plus a prepaid reply.

Young men were eager to enter the business as messengers, since it was often a stepping-stone to better things. One of the duties of messenger boys was to sweep out the operating room in the mornings, and this provided an opportunity to tinker on the apparatus and learn the telegrapher's craft. Thomas Edison and steel magnate and philanthropist Andrew Carnegie both started out as telegraph messenger boys. "A messenger boy in those days had many pleasures," wrote Carnegie in his autobiography, which includes rather rose-tinted reminiscences of the life of a messenger boy in the 1850s. "There were wholesale fruit stores, where a pocketful of apples was sometimes to be had for the prompt delivery of a message; bakers and confectioners' shops where sweet cakes were sometimes given to him. He met very kind men to whom he looked up with respect; they spoke a pleasant word and complimented him on his promptness, perhaps asking him to deliver a message on the way back to the office. I do not know a situation in which a boy is more apt to attract attention, which is all a really clever boy requires in order to rise."

Though its business was the sending and receiving of messages, much like e-mail today, the actual operation of the telegraph had more in common with an on-line chat

room. Operators did more than just send messages back and forth; they had to call up certain stations, ask for messages to be repeated, and verify the reception of messages. In countries where Morse's apparatus was used, skilled operators quickly learned to read incoming messages by listening to the clicking of the apparatus, rather than reading the dots and dashes marked on the paper tape, and this practice soon became the standard means of receiving. It also encouraged more social interaction over the wires, and a new telegraphic jargon quickly emerged.

Rather than spell out every word ("PHILADELPHIA CALLING NEW YORK") letter by letter in laborious detail, conventions arose by which telegraphers talked to each other over the wires using short abbreviations. There was no single standard: different dialects or customs arose on different telegraph lines. However, one listing of common abbreviations compiled in 1859 includes "I I" (dot dot, dot dot) for "I AM READY"; "G A" (dash dash dot, dot dash) for "GO AHEAD"; "S F D" for "STOP FOR DINNER"; "G M" for "GOOD MORNING." This system enabled telegraphers to greet one another and handle most common situations as easily as if they were in the same room. Numbers were also used as abbreviations: 1 meant "WAIT A MOMENT"; 2, "GET ANSWER IMMEDIATELY"; 33, "ANSWER PAID HERE." All telegraph offices on a branch line shared one wire, so at any time there could be several telegraphers listening in to wait for the line to become available. They could also chat, play chess, or tell jokes during quiet periods.

APPROPRIATELY ENOUGH for the nation that pioneered the first telegraphs, the French had their own twist on the use of pneumatic tubes. For of all the tube networks built around the world, the most successful was in Paris, where sending and receiving *pneus* became part of everyday life in the late nineteenth century. Like the pneumatic tube networks in many other major cities, the Paris network was extensive enough that many local messages could be sent from sender to recipient entirely by tube and messenger, without any need for telegraphic transmission. In these cases, the telegraph form that the sender wrote the message on actually ended up in the hands of the recipient—which meant that long messages were just as easy to deliver as short messages.

So, in 1879, a new pricing structure was announced: For messages traveling within the Paris tube network, the price was fixed, no matter how long the message. Faster than the post and cheaper than sending a telegram, this network provided a convenient way to send local messages within Paris, though the service was operated by the state telegraph company and the messages were officially regarded as telegrams.

Messages were written on special forms, which could be purchased, prepaid, in advance. These could then be deposited into small post boxes next to conventional mailboxes, handed in at telegraph counters in post offices, or put into boxes mounted on the backs of trams, which were

unloaded when the trams reached the end of the line. Once in the system, messages were sent along the tubes to the office nearest the destination and then delivered by messenger. Each message might have to pass through several sorting stations on the way to its destination; it was date-stamped at each one, so that its route could be determined. (The same is true of today's e-mail messages, whose headers reveal their exact paths across the Internet.) No enclosures were allowed to be included with messages, and any messages that broke this rule were transferred to the conventional postal service and charged at standard postal rates.

The scheme was a great success, and the volume of messages being passed around the network almost doubled in the first year. The network was further extended as a result, and for many years messages were affectionately known as *petits bleux*, after the blue color of the message forms.

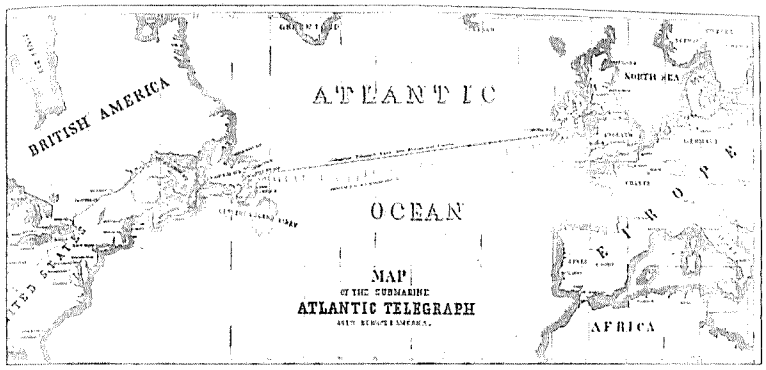
BY THE EARLY 1870S, the Victorian Internet had taken shape: A patchwork of telegraph networks, submarine cables, pneumatic tube systems, and messengers combined to deliver messages within hours over a vast area of the globe. New cables were being laid all over the world. Malta had been linked to Alexandria in 1868, and a direct cable was laid from

France to Newfoundland in 1869. Cables reached India, Hong Kong, China, and Japan in 1870; Australia was connected in 1871, and South America in 1874.

In 1844, when Morse had started building the network, there were a few dozen miles of wire and sending a message from, say, London to Bombay and back took ten weeks. But within thirty years there were over 650,000 miles of wire, 30,000 miles of submarine cable, and 20,000 towns and villages were on-line—and messages could be telegraphed from London to Bombay and back in as little as four minutes. "Time itself is telegraphed out of existence," declared the *Daily Telegraph* of London, a newspaper whose very name was chosen to give the impression of rapid, up-to-date delivery of news. The world had shrunk further and faster than it ever had before.

Morse's original telegraph line between Washington and Baltimore had hardly started out as a moneymaker; but the more points there were on the network, the more useful it became. By the late 1860s, the telegraph industry, and the submarine cable business in particular, was booming—and every investor wanted a piece of the action. "There can be no doubt that the most popular outlet now for commercial enterprise is to be found in the construction of submarine lines of telegraph," reported the *Times* of London in 1869. By 1880, there were almost 100,000 miles of undersea telegraph cable.

Improvements in submarine telegraphy made it possible to run telegraph cables directly from Britain to out-



posts of the British Empire, without having to rely on the goodwill of any other countries along the route, and "intra-imperial telegraphy" was seen as an important means of centralizing control in London and protecting imperial traffic from prying eyes. The result was a separate British network that interconnected with the global telegraph network at key points.

As the network connected more and more countries, the peaceful sentiments that had been expressed on the completion of the Atlantic cable were extended to embrace the whole of humanity. The telegraph was increasingly hailed as nothing less than the instrument of world peace.

"It brings the world together. It joins the sundered

hemispheres. It unites distant nations, making them feel that they are members of one great family," wrote Cyrus Field's brother Henry. "An ocean cable is not an iron chain, lying cold and dead in the icy depths of the Atlantic. It is a living, fleshy bond between severed portions of the human family, along which pulses of love and tenderness will run backward and forward forever. By such strong ties does it tend to bind the human race in unity, peace and concord. . . . it seems as if this sea-nymph, rising out of the waves, was born to be the herald of peace."

Or, as another poetically inclined advocate of the telegraph's peacemaking powers put it: "The different nations and races of men will stand, as it were, in the presence of one another. They will know one another better. They will act and react upon each other. They may be moved by common sympathies and swayed by common interests. Thus the electric spark is the true Promethean fire which is to kindle human hearts. Men then will learn that they are brethren, and that it is not less their interest than their duty to cultivate goodwill and peace throughout the earth."

Unfortunately, the social impact of the global telegraph network did not turn out to be so straightforward. Better communication does not necessarily lead to a wider understanding of other points of view; the potential of new technologies to change things for the better is invariably overstated, while the ways in which they will make things worse are usually unforeseen.

7.

CODES, HACKERS, AND CHEATS

Some simple yet secure cipher, easily acquired and easily read, should be introduced, by which means messages might to all intents and purposes be "sealed" to any person except the recipient.

—*QUARTERLY REVIEW*, 1853

Ever since people have invented things, other people have found ways to put those things to criminal use. "It is a well-known fact that no other section of the population avail themselves more readily and speedily of the latest triumphs of science than the criminal class," declared Inspector John Bonfield, a Chicago policeman, to the *Chicago Herald* in 1888. "The educated criminal skims the cream from every new invention, if he can make use of it." The telegraph was no excep-

Admittedly, there was a rapid turnover of employees in major offices, and telegraphers often had to endure unsociable hours, long shifts, and stressful and unpleasant working conditions. But to become a telegrapher was to join a vast on-line community—and to seek a place among the thousands of men and women united via the worldwide web of wires that trussed up the entire planet.

9.

War and Peace in the Global Village

All the inhabitants of the earth would be brought into one intellectual neighborhood.

—Alonzo Jackman, advocating an Atlantic telegraph in 1846

Despite the widely expressed optimism that the telegraphs would unite humanity, it was in fact only the telegraph operators who were able to communicate with each other directly. But thanks to the telegraph, the general public became participants in a continually unfolding global drama, courtesy of their newspapers, which were suddenly able to report on events on the other side of the world within hours of their occurrence. The result was a dramatic change in worldview; but to appreciate the extent to which the telegraph caused an earthquake in the newspaper business requires

an understanding of how newspapers were run in the pre-telegraph era.

At the beginning of the nineteenth century, newspapers tended to cover a small locality, and news traveled as the papers themselves were carried from one place to another. One journalist, Charles Congdon, complained that in those days there was hardly anything in his local New England newspaper. "In that time of small things," he wrote in his memoirs, "subscribers must have been easily satisfied. The news from Europe, when there was any, was usually about six weeks old, or even older." There were very few letters from foreign correspondents, he noted, which was a good thing, "for most of them were far from interesting."

Today, the common perception of a journalist is someone who will stop at nothing to get hold of a story and rush it into the newsroom. But in the early nineteenth century, newspapers traded on their local coverage, not the timeliness of their news. Congdon tells of one editor who refused a journalist's request to visit a nearby town to report on a speech, saying "Somebody will send us in something about it in two or three days." Some newspapers printed on a different day each week to fit in with the social life of the editor; others rationed the amount of news they printed in a busy week, in case there was a shortage of news the following week. And apart from local stories, most other news was taken from the pages of other papers, which were delivered by post—days after publication. Newspapers reprinted

each other's stories freely; news moved so slowly that there was no danger that one paper would steal another's story and be on sale at the same time. The free exchange of information that resulted was beneficial to all concerned, though it meant that news was often days or weeks old by the time it reached its readers.

In addition, some of the larger newspapers had correspondents in foreign countries, who would write in to report the latest news from distant cities. Their letters took weeks to arrive, but before the establishment of the telegraph network, there was no other way to send news. It was commonplace for foreign news to be weeks or months old by the time it appeared in print. The *Times* of London had a particularly extensive network of foreign correspondents, so that its largely business readership could be kept informed of overseas political developments that might affect trade. Foreign reports also reported the arrival and departure of ships and detailed their cargoes. But since the news traveled no faster than the ships that carried it, the January 9, 1845, edition of the *Times* included reports from Cape Town that were eight weeks old and news from Rio that was six weeks old. The delay for news from New York was four weeks, and for news from Berlin a week. And the *Times* was a newspaper that prided itself on getting the news by the fastest means possible.

The existence of a newspaper tax in Britain kept prices artificially high, so the *Times* had the market to itself. But in New York things started to heat up in the 1820s

with the fierce competition between the *Journal of Commerce* and the rival *Courier and Enquirer*. Both papers were aimed at business readers and fought to distinguish themselves by being first with the news. They established rival pony expresses between New York and Washington to get the political news sooner, and used fast boats to meet incoming vessels from Europe and get the latest news before they docked. Then, in the 1830s, newspapers became a popular medium with the establishment of cheap, mass-market titles. The ensuing rivalry between the newspapers of the so-called penny press led to an increase in the use of carrier pigeons and ships. One editor, James Gordon Bennett of the *New York Herald*, even agreed to pay one of his sources a $500 bonus for every hour European news arrived at the *Herald* in advance of its competitors. Get the news first, and you'll sell more papers: Increasingly, news was worth money.

So it was clear that the establishment of telegraph lines in the 1840s would change everything. In fact, the second message sent on Morse's Washington-Baltimore line—immediately after "WHAT HATH GOD WROUGHT"—was "HAVE YOU ANY NEWS?" But far from welcoming the telegraph, many newspapers feared it.

ALTHOUGH receiving news by telegraph would seem to be the logical next step from using horses, carrier pigeons, and so on, it was instead

viewed as an ominous development. The telegraph could deliver news almost instantly, so the competition to see who could get the news first was, in effect, over. The winner would no longer be one of the newspapers; it would be the telegraph. James Gordon Bennett was one of many who assumed that the telegraph would actually put newspapers out of business; because it put all newspapers on a level playing field, his shenanigans to get hold of the news earlier than his rivals would no longer be an advantage. "The telegraph may not affect magazine literature," he suggested, "but the mere newspapers must submit to destiny, and go out of existence." The only role left for printed publications, it seemed, would be to comment on the news and provide analysis.

Of course, this perception turned out to be wrong. While the telegraph was a very efficient means of delivering news to newspaper offices, it was not suitable for distributing the news to large numbers of readers. And although the telegraph did indeed dramatically alter the balance of power between providers and publishers of information, the newspaper proprietors soon realized that, far from putting them out of business, it actually offered great opportunities. For example, breaking news could be reported as it happened, in installments—increasing the suspense and boosting sales. If there were four developments to a major story during the day, newspapers could put out four editions—and some people would buy all four.

But with news available instantly from distant places,

the question arose, Who ought to be doing the reporting? Reporters as we know them today did not exist. So who should get the news? One suggestion was that telegraph operators, who were sprinkled all over the world, should act as reporters. But the handful of telegraph companies that tried to press operators into journalistic service, and then sell their reports to newspapers, found that operators tended to make pretty hopeless journalists. On the other hand, if each newspaper sent its own writer to cover a far-off story, they all ended up sending similar dispatches back from the same place along the same telegraph wire, at great expense.

The logical solution was for newspapers to form groups and cooperate, establishing networks of reporters whose dispatches would be telegraphed back to a central office and then made available to all member newspapers. This would give newspapers the advantage of a far greater reach than they would have had otherwise, without the expense of maintaining dozens of their own reporters in far-flung places. In the United States, the first and one of the best known of these organizations, which came to be called news agencies, was the New York Associated Press, a syndicate of New York newspapers set up in 1848 that quickly established cozy relationships with the telegraph companies and was soon able to dominate the business of selling news to newspapers.

In Europe, meanwhile, Paul Julius von Reuter was also establishing a news agency. Born in Germany, Reuter

started out working for a translation house that took stories from various European newspapers, translated them into different languages, and redistributed them. Reuter soon realized that some stories were more valuable than others, and that businessmen in particular were willing to pay for timely information, so he set up his own operation, using carrier pigeons to supply business information several hours before it could be delivered by mail. Initially operating between Aix-la-Chapelle and Brussels, the Reuter network of correspondents extended across Europe during the 1840s. Each day, after the afternoon close of the stock markets, Reuter's representative in each town would take the latest prices of bonds, stocks, and shares, copy them onto tissue paper, and place them in a silken bag, which was taken by homing pigeon to Reuter's headquarters. For security, three pigeons were sent, carrying copies of each message. Reuter then compiled summaries and delivered them to his subscribers, and he was soon supplying rudimentary news reports too.

When the electric telegraph was established between Aix-la-Chapelle and Berlin, Reuter started to use it alongside his pigeons; when England and France were linked by telegraph in 1851, Reuter moved to London. His policy was "follow the cable," so London was the place to be, since it was both the financial capital of the world and the center of the rapidly expanding international telegraph network.

Although Reuter's reports of foreign events were initially very business oriented—the only angle his business

customers were interested in was how trade would be affected—he soon started trying to sell his dispatches to newspapers. With the abolition of the newspaper tax in Britain in 1855, several new newspapers sprung up, but only the *Times* was capable of covering foreign news, thanks to its well-established network of correspondents who, after some reluctance, started using the telegraphs. The *Times* preferred to use its own reports rather than buy them from Reuter, and turned down the opportunity to do a deal with him three times. Eventually Reuter proved the value of his service in 1859 when he obtained a copy of a crucial French speech concerning relations with Austria and was able to provide it to the *Times* in London within two hours of its being delivered in Paris. During the ensuing war, with the French and Sardinians on one side, and the Austrians on the other, Reuter's correspondents reported from all three camps—and on one occasion dispatched three separate reports of the same battle from the point of view of each of the armies involved. Even so, the *Times* still preferred to rely on its own correspondents, but Reuter was able to sell his dispatches to its rival London newspapers, thus helping them compete with the *Times* without having their own foreign correspondents.

And readers just couldn't get enough foreign news—the more foreign, the better. Instead of limiting their coverage to a small locality, newspapers were able for the first time to give at least the illusion of global coverage, providing a summary of all the significant events of the day, from

all over the world, in a single edition. We take this for granted today, but at the time the idea of being able to keep up with world affairs, and feel part of an extended global community, was extraordinary.

It was great for sales, too. "To the press the electric telegraph is an invention of immense value," declared one journalist. "It gives you the news before the circumstances have had time to alter. The press is enabled to lay it fresh before the reader like a steak hot from the gridiron, instead of being cooled and rendered flavourless by a slow journey from a distant kitchen. A battle is fought three thousand miles away, and we have the particulars while they are taking the wounded to the hospital."

The thirst for foreign news was such that when the first transatlantic telegraph cable was completed in 1858, one of the few messages to be successfully transmitted was the news from Europe, as provided by Reuter. "PRAY GIVE US SOME NEWS FOR NEW YORK, THEY ARE MAD FOR NEWS," came the request down the cable from Newfoundland. And so on August 27, 1858, the news headlines were as follows: "EMPEROR OF FRANCE RETURNED TO PARIS. KING OF PRUSSIA TOO ILL TO VISIT QUEEN VICTORIA. SETTLEMENT OF CHINESE QUESTION. GWALIOR INSURGENT ARMY BROKEN UP. ALL INDIA BECOMING TRANQUIL."

This last headline indicated that the Indian Mutiny, a serious rebellion against British rule that had broken out the year before, had been suppressed. However, General Trollope, commander of the British forces in Halifax, Nova

Scotia, had received an order a few weeks earlier by sea from his superiors in London, asking him to send two regiments of troops back across the Atlantic so that they could be redeployed in India. It is not clear whether or not Trollope was aware of the Reuter report, but it clearly indicated that his troops were no longer needed. A telegram from London to General Trollope countermanding the original order was hurriedly sent down the new Atlantic cable, telling him to stay put, and saving the British government £50,000 at a stroke—more than paying back its investment in the cable. It was one of the last messages to reach North America via the ill-fated cable, which stopped working the next day.

But what if the cable had failed earlier? Had he been aware of the Reuter report, Trollope would have known that there was in fact no need for him to send his troops to India, though he would have no doubt followed orders and sent them anyway. This was just one example of how the rapid and widespread distribution of foreign news had unforeseen military and diplomatic implications—something that was brought home to everyone during the Crimean War.

During wartime, the existence of an international telegraph network meant that news that had hitherto been safe to reveal to newspapers suddenly became highly sensitive, since it could be

immediately telegraphed directly into the hands of the enemy. For years it had been customary in Britain for news of departing ships to be reported as they headed off to foreign conflicts; after all, the news could travel no faster than the ships themselves. But the telegraph meant that whatever information was made available in one country was soon known overseas. This took a lot of getting used to, both by governments and news organizations.

As troops departed for the Crimean peninsula following the declaration of war on Russia by France and Britain in March 1854, the War Ministry in London issued precise details of the number and nature of the forces being deployed. This information was faithfully reproduced in the *Times*, which wanted to capitalize on enthusiasm for the war by providing its readers with as much information as possible. Normally the troops would have outstripped the news of their arrival. But with the telegraph network reaching across Europe to the enemy in St. Petersburg, daily reports of the British plans, lifted from that day's copy of the *Times*, could be telegraphed to Russia.

The incompetence of the British government served to complicate matters; some officials quickly realized the dangers of revealing too much information, while others thought that being open with the newspapers was a good way to maintain morale and show that the government was responsive to public enthusiasm for the war. Inevitably, the government and the *Times* were soon at loggerheads. The British commander in chief, General Simpson, com-

plained: "Our spies give us all manner of reports, while the enemy never spends a farthing for information. He gets it all for five pence from a London paper."

In addition to being the first war in which a government had to take the existence of the telegraph into account when making news public, the Crimean War was the first in which the telegraph played a strategic role. Initially, messages were sent by telegraph as far as Marseilles, and then by steamer to the Crimea, arriving as much as three weeks later. Rather than wait for a private telegraph company to step in, the British and French governments decided to extend the telegraph network to the Crimea themselves. The line was extended overland from Bucharest, the farthest extremity of the Austrian network, to Varna on the Black Sea, and a British company was then contracted to lay a 340-mile submarine cable across to the Crimean peninsula. For the first time, French and British governments could communicate directly with commanders on a distant battlefield. This was further bad news for General Simpson, who was so exasperated by trivial inquiries from his incompetent superiors in London that he is said to have complained that "the confounded telegraph has ruined everything."

For who was better placed to make strategic decisions: the commander at the scene or his distant superiors? In his history of the Crimean War, the historian A. W. Kinglake referred to the telegraph as "that new and dangerous magic" that played into the hands of meddling officials

who were nowhere near the battlefield. "Our government did not abuse it," he declared, "but, exposed to swift dictation from Paris, the French had to learn what it was to carry on a war with a Louis Napoleon planted at one of the ends of the wire, and at the other, a commander like Canrobert, who did not dare to meet Palace strategy with respectful evasions, still less with plain, resolute words."

The telegraph was to cause further complications when it was used to send reports to London from the front revealing the chaotic nature of the campaign. The war was very badly organized, and although public sentiment in Britain was in favor of military action, there was widespread exasperation at the government's mismanagement, spelled out in dispatches from the front line by the *Times*'s reporter William Howard Russell. He exposed stories of soldiers being sent to the front wrongly or inadequately equipped, and highlighted the lack of proper medical support (which led to a public appeal that funded Florence Nightingale's mercy mission). It was perhaps hardly surprising that the *Times* was not allowed to use the Black Sea cable to send back its stories. Instead, reports were sent by steamer to Varna or Constantinople and then by wire to London.

The telegraph had annihilated the distance between the soldiers at the front and the readers back home, and between the government and its generals. Rather less conveniently, it had also annihilated the distance between the enemy capitals. Suddenly, the world had shrunk—

something that diplomats found particularly hard to swallow.

TRADITIONALLY, diplomats prefer slow, measured responses to events, but the telegraph encouraged instant reaction—"and I do not know that with our business it is very desirable that it should be so," warned Edmond Hammond, a British diplomat at the time of the Crimean War. He feared that diplomats would end up responding to "off-hand points which had much better be considered." Charles Mazade, a French historian, even went so far as to suggest that the Franco-Prussian War of 1870–71 was a direct result of diplomats reacting too hastily to telegraphic dispatches. But they had no choice; once the newspapers got hold of news, they would demand a statement from the government, which would then find its way into the hands of foreign governments via the media, circumventing conventional diplomatic channels.

There was only one thing for it: Diplomats would have to embrace the telegraph. So they did, albeit slowly. Until 1859, the British Foreign Office was just another customer at the telegraph office, and sent messages only during business hours; but by 1870, there were permanent lines installed at the Foreign and Colonial offices. Some officials were so keen on using the telegraph that they even had lines installed at their London homes and country houses,

so that they could stay in touch with goings-on around the world. The effect was to centralize power in London; and for officials in distant countries who found their independence from central government undermined by the telegraph, the new technology was a curse. Sir Horace Rumbold, the British ambassador in Vienna, lamented "the telegraphic demoralization of those who formerly had to act for themselves."

But despite its adoption by diplomats, the telegraph was used to order troops into battle just as often as it was used to defuse a crisis. It was widely deployed during the American Civil War, with soldiers on each side stringing up a total of 15,000 miles of telegraph wire as they advanced, and engaging in much skulduggery with tapped wires and secret codes. Similarly, the telegraph proved its value as a military tool in Europe, where it was used by the Prussians to coordinate a pincer movement that led directly to their victory over the French at Könniggrätz.

Nevertheless, many people were still fervent believers in the peacemaking potential of the telegraph. In 1894, Sir John Pender, chairman of the company that had previously been the Gutta Percha Company and is known today as Cable & Wireless, suggested that telegraphy had "prevented diplomatic ruptures and consequent war, and been instrumental in promoting peace and happiness. . . . no time was allowed for the growth of bad feeling or the nursing of a grievance. The cable nipped the evil of misunderstanding leading to war in the bud."

Well, sort of. But sometimes misunderstanding was deliberate. In 1898, the Fashoda Incident, a standoff between the British and French armies in Sudan, illustrated the new power of information—and disinformation. French forces led by Major Jean-Baptiste Marchand were crossing Africa with the intention of laying claim to land from the Atlantic to the Red Sea, while a rival British expedition led by Lord Kitchener was hoping to establish control over the whole of East Africa, from Cairo to the southern Cape. Inevitably, the paths of the two armies crossed—at the Sudanese village of Fashoda. Rather than risk starting a war between two major powers, Kitchener and Marchand decided that the whole business was best left to the governments of France and Britain to sort out through diplomatic channels.

But Kitchener had a crucial advantage over Marchand: access to the British-controlled Egyptian telegraph network. He was able to send to London an immediate report on the situation, which traveled via the Egyptian railway telegraph network and then by submarine cable. He then followed up with a more detailed report, in which he suggested that Marchand's forces, which were in fact comparable in strength to his own, were demoralized, anxious, and in danger of running out of water—none of which was strictly true. But Marchand's only means of communication with his superiors in Paris was to send a messenger overland to the Atlantic coast and then on by sea—a process that would have taken nine months. As a result, the

first the French government heard of the matter was when the British ambassador in Paris read Kitchener's report to the French foreign minister. Anxious to hear Marchand's side of the story, the French asked for permission to communicate with Fashoda via the British-controlled telegraph lines. The British refused but offered a compromise: If Marchand sent a messenger to Cairo, he could send messages from there. In the month it took for Marchand's representative to reach Cairo and file his report, the French had only Kitchener's version of events to go on, and took the decision to back down. The telegraph had, arguably, prevented bloodshed, if only through the use of misinformation.

OPTIMISM ABOUT THE peacemaking potential of the telegraph was still widespread at the close of the century, even though there was no evidence that it had made any real difference one way or the other. "If the peoples have been brought more in touch with each other, so also have their rulers and statesmen," wrote the British electrician and telegraph expert Charles Bright in his book, *Submarine Telegraphs*, published in 1898. "An entirely new and much-improved method of conducting diplomatic relations between one country and another has come into use with the telegraph wire and cable. The facility and rapidity with which one government is now enabled to know the 'mind'—or, at any rate, the

professed mind—of another, has often been the means of averting diplomatic ruptures and consequent wars during the last few decades. At first sight, the contrary result might have been anticipated; but, on the whole, experience distinctly pronounces in favour of the pacific effects of telegraphy."

Further optimism arose from the feeling of shared experience felt by newspaper readers around the world as they followed unfolding events. One such example was the slow and lingering death of President James Garfield in 1881, two months after being shot and wounded.

In an article published in 1881, *Scientific American* assessed the "moral influence of the telegraph," which had enabled a global community to receive regular updates about his condition. Citing this as "a signal demonstration of the kinship of humanity," the article explained how "the touch of the telegraph key welded human sympathy and made possible its manifestation in a common universal, simultaneous heart throb. We have just seen the civilized world gathered as one family around a common sick bed, hope and fear alternately fluctuating in unison the world over as hopeful or alarming bulletins passed with electric pulsations over the continents and under the seas." It was, the magazine declared, "a spectacle unparalleled in history; a spectacle impossible on so grand a scale before, and indicative of a day when science shall have so blended, interwoven and unified human thoughts and interests that the feeling of universal kinship shall be, not a spasmodic outburst of occasional emotion, but constant and controlling, the usual, everyday, abiding feeling of all men toward all men."

This sort of hyperbole shows just how easy it was to assume that world peace would inevitably follow from shared experience. As one writer put it in 1878, the telegraph "gave races of men in various far-separated climes a sense of unity. In a very remarkable degree the telegraph confederated human sympathies and elevated the conception of human brotherhood. By it the peoples of the world were made to stand closer together." The rapid distribution of news was thought to promote universal peace, truthfulness, and mutual understanding. In order to understand your fellow men, you really couldn't have too much news.

Or could you? Not everyone wanted to know what was going on in far-flung countries. The precedence given to what it saw as irrelevant foreign news over important local stories even led the *Alpena Echo*, a small newspaper in Michigan, to cut off its daily telegraph service in protest. According to a contemporary account, this was because "it could not tell why the telegraph company caused it to be sent a full account of a flood in Shanghai, a massacre in Calcutta, a sailor fight in Bombay, hard frosts in Siberia, a missionary banquet in Madagascar, the price of kangaroo leather from Borneo, and a lot of nice cheerful news from the Archipelagoes—and not a line about the Muskegon fire." The seeds had been sown for a new problem: information overload.

the 1880s and the telephone continued its rapid growth, the telegraph was no longer at the cutting edge of technology. "So much have times altered in the last fifty years that the electric telegraph itself is threatened in its turn with serious rivalry at the hands of a youthful and vigourous competitor. A great future is doubtless in store for the telephone," declared *Chambers Journal* in 1885.

By this time, many telegraphers were complaining that they had been reduced to mere machines, while others decried the declining quality of those entering the profession. "The character of the business has wholly changed," lamented the *Journal of the Telegraph*. "It cannot now subserve public interests or its own healthful development without the precision and uniformity of mechanism."

But the changing fortunes of telegraphy were perhaps most vividly illustrated in the way the telegraphic journals, which had covered the rise of the new electrical and telephonic technologies with keen interest, chose to rename themselves: the *Telegraphers' Advocate* became the *Electric Age*, the *Operator* renamed itself *Electrical World*, and the *Telegraphic Journal* became the *Electrical Review*. Undermined by the relentless advance of technology, the telegraphic community, along with its customs and subculture, began to wither and decline.

12.

THE LEGACY OF THE TELEGRAPH

What now my old telegraph,
At the top of your old tower,
As somber as an epitaph,
And as still as a boulder?
— from "Le Vieux Télégraphe," a poem by
Gustave Nadaud, translated by the author

Morse never saw the birth of the inventions that would overshadow the telegraph. He agreed to unveil a statue of Benjamin Franklin in Printing House Square in New York, but exposure to the bitterly cold weather on the day of the ceremony weakened him considerably. As he lay on his sickbed a few weeks later, his doctor tapped his chest and said, "This is the way we doctors telegraph, Professor." Morse smiled and replied, "Very good, very good." They were his last

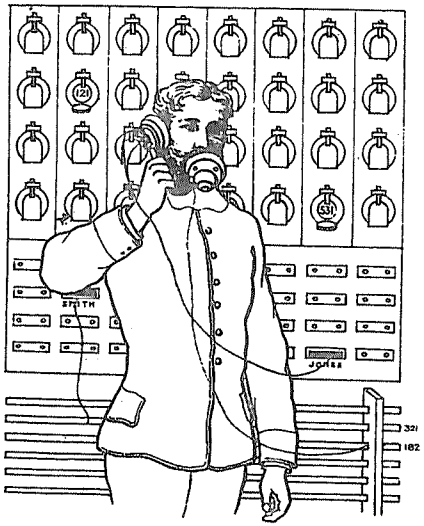
words. He died in New York on April 2, 1872, at the age of eighty-one, and was buried in the Greenwood Cemetery. Shortly before his death, his estate had been valued at half a million dollars—a respectable sum, though less than the fortunes amassed by the entrepreneurs who built empires on the back of his invention. But it was more than enough for Morse, who had given freely to charity and endowed a lectureship on "the relation of the Bible to the Sciences."

Arguably, the tradition of the gentleman amateur scientist died with him. The telegraph had originated with Morse and Cooke, both of whom combined a sense of curiosity and invention with the single-mindedness needed to get it off the ground; it had then entered an era of consolidation, during which scientists like Thomson and Wheatstone provided its theoretical underpinnings; and it had ended up the province of the usual businessmen who take over whenever an industry becomes sufficiently stable, profitable, and predictable. (Edison might appear to have much in common with Morse and Cooke on the surface, but he was no amateur; he could never have devised the quadruplex without a keen understanding of electrical theory, something that both Morse and Cooke lacked.)

Wheatstone died in 1875, having amassed many honors and a respectable fortune from the sale of his various telegraphic patents. Like Morse, he was made a chevalier of the Legion of Honor, and he was knighted in 1868 following the success of the Atlantic cable. By the time of his death, he had received enough medals to fill a box a cubic

foot in capacity—and he was still not getting on with Cooke. Wheatstone refused the offer of the Albert Medal from the Royal Society of Arts, because it was also offered to Cooke, and Wheatstone resented the implication of equality. He continued to work as a scientist, with particular interest in optics, acoustics, and electricity, and he died a rich and well-respected man. Alongside his innovations in the field of telegraphy, he invented the stereoscope and the concertina, though today his name is known to students via the Wheatstone bridge, a method of determining electrical resistance that, somewhat characteristically, he did not actually invent but helped to popularize.

Cooke, on the other hand, failed to distinguish himself after his promising start; indeed, it's not hard to see why Wheatstone so resented being compared to him. He worked as an official of the Electrical Telegraph Company from its establishment in 1845 until it was taken into state control by the British government in 1869, when he was knighted. But he was soon in financial difficulties. He bought a quarry and poured the money he obtained from the sale of his share of the telegraph patent into a handful of abortive new inventions, including stone- and slate-cutting machines, and a design for a rope-hauled railway with remote-controlled doors that he unsuccessfully tried to have adopted on the underground railway in London. The prime minister, William Gladstone, was alerted to his plight and granted him a £100 annual state pension, the maximum possible amount. But it was not enough to keep



An early telephone exchange.

Cooke out of debt. His rivalry with Wheatstone continued until Wheatstone's death; Cooke attended his funeral and was, curiously, far more accurate in his recollection of Wheatstone's role in the invention of the telegraph thereafter. He died in 1879, having squandered his fortune.

By the late 1880s, the telephone was booming. In 1886, ten years after its invention, there were over a quarter of a million telephones in use worldwide. Early technological hurdles such as low sound quality, long-distance calling, and the design of efficient manual and automatic telephone exchanges were rapidly overcome by Edison, Hughes, Watson, and others, and by the turn of the century there were nearly 2 million phones in use. (Bell did little

to improve his invention; once its success was assured, he turned his attention to aviation instead.)

When Queen Victoria's reign ended in 1901, the telegraph's greatest days were behind it. There was a telephone in one in ten homes in the United States, and it was being swiftly adopted all over the country. In 1903, the English inventor Donald Murray combined the best features of the Wheatstone and Baudot automatic telegraph systems into a single machine, which, with the addition of a typewriter keyboard, soon evolved into the teleprinter. Like the telephone, it could be operated by anyone.

The heyday of the telegrapher as a highly paid, highly skilled information worker was over; telegraphers' brief tenure as members of an elite community with mastery over a miraculous, cutting-edge technology had come to an end. As the twentieth century dawned, the telegraph's inventors had died, its community had crumbled, and its golden age had ended.

ALTHOUGH IT HAS now faded from view, the telegraph lives on within the communications technologies that have subsequently built upon its foundations: the telephone, the fax machine, and, more recently, the Internet. And, ironically, it is the Internet—despite being regarded as a quintessentially modern means of communication—that has the most in common with its telegraphic ancestor.

Like the telegraph network, the Internet allows people to communicate across great distances using interconnected networks. (Indeed, the generic term *internet* simply means a group of interconnected networks.) Common rules and protocols enable any sort of computer to exchange messages with any other—just as messages could easily be passed from one kind of telegraph apparatus (a Morse printer, say) to another (a pneumatic tube). The journey of an e-mail message, as it hops from mail server to mail server toward its destination, mirrors the passage of a telegram from one telegraph office to the next.

There are even echoes of the earliest, most primitive telegraphs—such as the optical system invented by Chappe—in today's modems and network hardware. Every time two computers exchange an eight-digit binary number, or byte, they are going through the same motions as an eight-panel shutter telegraph would have done two hundred years ago. Instead of using a codebook to relate each combination to a different word, today's computers use another agreed-upon protocol to transmit individual letters. This scheme, called ASCII (for American Standard Code for Information Interchange), says, for example, that a capital "A" should be represented by the pattern 01000001; but in essence the principles are unchanged since the late eighteenth century. Similarly, Chappe's system had special codes to increase or reduce the rate of transmission, or to request that garbled information be sent again—all of which are features of modems today. The

protocols used by modems are decided on by the ITU, the organization founded in 1865 to regulate international telegraphy. The initials now stand for International Telecommunication Union, rather than International Telegraph Union.

More striking still are the parallels between the social impact of the telegraph and that of the Internet. Public reaction to the new technologies was, in both cases, a confused mixture of hype and skepticism. Just as many Victorians believed the telegraph would eliminate misunderstanding between nations and usher in a new era of world peace, an avalanche of media coverage has lauded the Internet as a powerful new medium that will transform and improve our lives.

Some of these claims sound oddly familiar. In his 1997 book *What Will Be: How the New World of Information Will Change Our Lives*, Michael Dertouzos of the Laboratory for Computer Science at the Massachusetts Institute of Technology wrote of the prospect of "computer-aided peace" made possible by digital networks like the Internet. "A common bond reached through electronic proximity may help stave off future flareups of ethnic hatred and national breakups," he suggested. In a conference speech in November 1997, Nicholas Negroponte, head of the MIT Media Laboratory, explicitly declared that the Internet would break down national borders and lead to world peace. In the future, he claimed, children "are not going to know what nationalism is."

The similarities do not end there. Scam artists found crooked ways to make money by manipulating the transmission of stock prices and the results of horse races using the telegraph; their twentieth-century counterparts have used the Internet to set up fake "shop fronts" purporting to be legitimate providers of financial services, before disappearing with the money handed over by would-be investors; hackers have broken into improperly secured computers and made off with lists of credit card numbers.

People who were worried about inadequate security on the telegraph network, and now on the Internet, turned to the same solution: secret codes. Today software to compress files and encrypt messages before sending them across the Internet is as widely used as the commercial codes that flourished on the telegraph network. And just as the ITU placed restrictions on the use of telegraphic ciphers, many governments today are trying to do the same with computer cryptography, by imposing limits on the complexity of the encryption available to Internet users. (The ITU, it should be noted, proved unable to enforce its rules restricting the types of code words that could be used in telegrams, and eventually abandoned them.)

On a simpler level, both the telegraph and the Internet have given rise to their own jargon and abbreviations. Rather than plugs, boomers, or bonus men, Internet users are variously known as surfers, netheads, or net-

izens. Personal signatures, used by both telegraphers and Internet users, are known in both cases as sigs.

Another parallel is the eternal enmity between new, inexperienced users and experienced old hands. Highly skilled telegraphers in city offices would lose their temper when forced to deal with hopelessly inept operators in remote villages; the same phenomenon was widespread on the Internet when the masses first surged on-line in the early 1990s, unaware of customs and traditions that had held sway on the Internet for years and capable of what, to experienced users, seemed unbelievable stupidity, gullibility, and impoliteness.

But while conflict and rivalry both seem to come with the on-line territory, so does romance. A general fascination with the romantic possibilities of the new technology has been a feature of both the nineteenth and twentieth centuries: On-line weddings have taken place over both the telegraph and the Internet. In 1996, Sue Helle and Lynn Bottoms were married on-line by a minister 10 miles away in Seattle, echoing the story of Philip Reade and Clara Choate, who were married by telegraph 120 years earlier by a minister 650 miles away. Both technologies have also been directly blamed for causing romantic problems. In 1996, a New Jersey man filed for divorce when he discovered that his wife had been exchanging explicit e-mail with another man, a case that was widely reported as the first example of "Internet divorce."

After a period of initial skepticism, businesses became the most enthusiastic adopters of the telegraph in the nineteenth century and the Internet in the twentieth. Businesses have always been prepared to pay for premium services like private leased lines and value-added information—provided those services can provide a competitive advantage in the marketplace. Internet sites routinely offer stock prices and news headlines, both of which were available over a hundred years ago via stock tickers and news wires. And just as the telegraph led to a direct increase in the pace and stress of business life, today the complaint of information overload, blamed on the Internet, is commonplace.

The telegraph also made possible new business practices, facilitating the rise of large companies centrally controlled from a head office. Today, the Internet once again promises to redefine the way people work, through emerging trends like teleworking (working from a distant location, with a network connection to one's office) and virtual corporations (where there is no central office, just a distributed group of employees who communicate over a network).

The similarities between the telegraph and the Internet—both in their technical underpinnings and their social impact—are striking. But the story of the telegraph contains a deeper lesson. Because of its ability to link distant peoples, the telegraph was the first technology to be seized upon as a panacea. Given its potential to change the world, the telegraph was soon being hailed as a means of

solving the world's problems. It failed to do so, of course—but we have been pinning the same hope on other new technologies ever since.

In the 1890s, advocates of electricity claimed it would eliminate the drudgery of manual work and create a world of abundance and peace. In the first decade of the twentieth century, aircraft inspired similar flights of fancy: Rapid intercontinental travel would, it was claimed, eliminate international differences and misunderstandings. (One commentator suggested that the age of aviation would be an "age of peace" because aircraft would make armies obsolete, since they would be vulnerable to attack from the air.) Similarly, television was expected to improve education, reduce social isolation, and enhance democracy. Nuclear power was supposed to usher in an age of plenty where electricity would be "too cheap to meter." The optimistic claims now being made about the Internet are merely the most recent examples in a tradition of technological utopianism that goes back to the first transatlantic telegraph cables, 150 years ago.

That the telegraph was so widely seen as a panacea is perhaps understandable. The fact that we are still making the same mistake today is less so. The irony is that even though it failed to live up to the utopian claims made about it, the telegraph really did transform the world. It also redefined forever our attitudes toward new technologies. In both respects, we are still living in the new world it inaugurated.

EPILOGUE

THE HYPE, skepticism, and bewilderment associated with the Internet—concerns about new forms of crime, adjustments in social mores, and redefinition of business practices—mirror the hopes, fears, and misunderstandings inspired by the telegraph. Indeed, they are only to be expected. They are the direct consequences of human nature, rather than technology.

Given a new invention, there will always be some people who see only its potential to do good, while others see new opportunities to commit crime or make money. We can expect exactly the same reactions to whatever new inventions appear in the twenty-first century.

Such reactions are amplified by what might be termed chronocentricity—the egotism that one's own generation is poised on the very cusp of history. Today, we are repeatedly told that we are in the midst of a communications revolution. But the electric telegraph was, in many ways, far more disconcerting for the inhabitants of the time than today's advances are for us. If any generation has the right to claim that it bore the full bewildering, world-shrinking brunt of such a revolution, it is not us—it is our nineteenth-century forebears.

Time-traveling Victorians arriving in the late twentieth century would, no doubt, be unimpressed by the Internet. They would surely find space flight and routine intercontinental air travel far more impressive technological achievements than our much-trumpeted global communications network. Heavier-than-air flying machines were, after all, thought by the Victorians to be totally impossible. But as for the Internet—well, they had one of their own.