

illegal immigration: fees have jumped from about \$350 to as much as \$1,000 per person for the trip from Mexico. While most immigration researchers have yet to factor smuggling into their analyses, Rotella wisely places it at the center of his account.

Rotella argues that the much-publicized border fence has not so much stopped the influx as redirected it to remote parts of the border where no fence has been built. Still, Rotella acknowledges that the fence has imposed order on what was verging on a Hobbesian state of nature. As recently as the early 1990s, the nightly scene a few minutes from downtown San Diego was one of border bandits robbing, raping, and murdering migrants. And the migrants, massed by the hundreds waiting to make their move, were themselves known to assault U.S. Border Patrol agents.

The violent heart of Rotella's account begins with the 1988 murder of a crusading Tijuana journalist and continues with the 1993 assassination of Cardinal Posadas of Guadalajara. In late February 1994, two Mexican drug traffickers with ties to the presidential campaign of Luis Colosio, presumptive successor to President Carlos Salinas, were shot while driving on Interstate

5, 75 miles north of Los Angeles. Days later, a machine-gun battle between federal and state police in a middle-class Tijuana neighborhood left five dead. Three weeks after that, presidential candidate Colosio was assassinated, apparently by a lone gunman, in a shantytown outside Tijuana. In April, the reform-minded chief of the Tijuana police was gunned down. And in January 1997, the special prosecutor investigating that murder was assassinated at his home; four gunmen riddled his body with more than 120 rounds and then ran over it with their van.

The link between these bloody events is of course the drug trade, specifically the battle among rival clans to control the lucrative U.S. market. In typically incisive fashion, Rotella asks whether the drug smugglers may be connected to the alien smugglers. His answer is no, at least not yet. But to read this remarkable book—all the more remarkable for its complete avoidance of moralizing, invective, sensationalism, and off-the-cuff policy prescriptions—is to feel confident that should this precarious situation change, Rotella will be the reporter who brings us the news.

—Peter Skerry

Science & Technology

ALEXANDER GRAHAM BELL:
*The Life and Times of the Man
Who Invented the Telephone.*

By Edwin S. Grosvenor and Morgan Wesson. Harry N. Abrams. 304 pp. \$45

This dramatically laid-out volume opens with a full-page blowup of a Victorian photograph. Fourteen-year-old Aleck Bell, book in



hand, leans pensively against a garden urn. The volume closes with a small head shot: Bell 65 years later, an old lion with fierce eyebrows and snow-white beard. This slightly blurred final image packs a surprise. It is not a photo but an early electronic facsimile, wired to New York from Cleveland over an experimental line in 1924.

The bracketing makes a biographical point, for Bell's career epitomizes the mentality that produced the technological leap. Thinking the unthought-of round the clock, he invented not only his world-transforming telephone but a metal detector, an early version of the iron lung, and a "photophone" that sent sound by light waves, preceding Marconi's wireless by 18 years. He built a hydrofoil driven by two 350-horsepower engines that zoomed to a world-record 70 miles per hour. Neck and neck with the Wright brothers, he and some partners constructed a powered air-

craft that flew 150 times without crashing. He conceived the idea of implanting radium in tumors to shrink them, founded the journal *Science*, experimentally bred ewes with extra nipples so they could suckle more offspring, and pondered global warming, which he named the “greenhouse effect.” The list goes on—not to mention that, as the son of one deaf woman and the husband of another, he considered his true life’s work to be the education of the deaf.

So innovating a life deserves a first-rate biography, and it has one: Robert V. Bruce’s *Bell: Alexander Graham Bell and the Conquest of Solitude* (1973). Although Grosvenor and Wesson do not change the contours of Bell’s career as Bruce mapped them, their text and captions provide a well-told, brief life of the inventor. They draw fresh material, too, from Bell’s huge correspondence, and they expand matters that Bruce treated in passing, especially the social effects of the telephone. But what sets apart their artbook-like volume are its 400 illustrations. More than half of them published here for the first time, they make an eye-popping pictorial commentary on Bell’s life and times. Many come from the thousand family photographs tucked in nooks and crannies of the Bell family home in Nova Scotia (Grosvenor is a great-grandson of Bell) or from 3,000 unpublished images of the phone industry in the early 20th century taken by the photographer Morris Rosenfeld.

Whether intimate or public, these unfamiliar illustrations have the spellbinding interest of the just-unearthed past. Here is the cabalistic-looking glove Bell used to teach a deaf boy, imprinted at fingertip, thumb, and palm with letters that could be touched to spell words. Through the window of a diving helmet we see the face of Bell’s adventurous wife, Mabel, as she prepared to descend underwater off Nassau. And, of course, everywhere the telephone. Early prototypes, some in glowing color plates: Bell’s “multiple harmonic telegraph,” his “liquid variable-resistance transmitter.” The succession of wrinkles and improvements: the first dial telephones, first nickel-in-slot pay phones. The transforming presence of the telephone on the American scene: a male operator seated at the San Francisco Chinatown switchboard, earphones braced over his long pigtail; a

hole-digging crew on the transcontinental line, working across the Nevada desert—in a covered wagon. And pervading all, the embryonic present. An early ad for the Bell system shows a long row of houses with open doors, and proclaims how, in connecting them, the telephone “provides a highway of universal communication.”

—Kenneth Silverman

NUMBER SENSE:
How the Mind Creates Mathematics.

By Stanislas Dehaene. Oxford Univ. Press. 274 pp. \$25

Where do numbers come from? Do they exist outside human beings, or did humanity invent them? Do they somehow exist beyond space and time, as one of my old neo-Platonist philosophy professors intimated? Are numbers the specifications for the architecture of the universe? In this engaging book, French psychologist Dehaene maintains that numbers originated with humans. He argues for the existence of a rudimentary “number sense,” encoded by evolution into the genes and brains of humans and many other animals. Using this innate sense, humankind has developed mathematics—a cultural creation much like literature, architecture, or art.

Studies have found that rats, chimpanzees, and pigeons have a built-in “accumulator” that allows them to keep rough track of a limited number of objects, usually about three. Human babies have the same ability, which is subject to the same limitation. But humans soon pass beyond this rudimentary skill and learn to estimate, compare, count, add, and subtract. As indicated by new forms of neurological imaging such as the PET scan and MRI, these skills reside in the inferior parietal region of both cerebral hemispheres. The parietal lobe is also where the neuronal circuits for sound, sight, and touch appear to come together; in this regard, “number sense” may be more than mere metaphor.

To support his mathematics-as-human-invention thesis, the author shows how numbers have been created through intellectual effort. The most primitive languages have words for numbers only up to three. Dehaene traces the development of number notation, which enabled our ancestors to name and to count ever higher. Each