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NATIONAL GEOGRAPHIC

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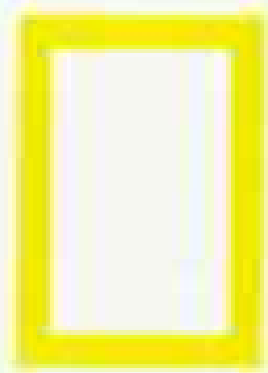
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Escaping horizontal congestion, these tallest of buildings are soaring monuments to the skill of architect and engineer. William S. Ellis and photographer Nathan Benn explore the towers, top to bottom.

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SPECIAL PLACES OF THE WORLD Mapping Two Great Parks

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COVER: Bison graze a meadow in Yellowstone National Park while fire sweeps the forest nearby. Photograph by Stephen M. Dowell, Bozeman Daily Chronicle.



REPLACING A LIGHT BULB



THE CORNER GROCERY



NONAGERARIAN AT WORK



A PARK'S TRAIL BY FIRE

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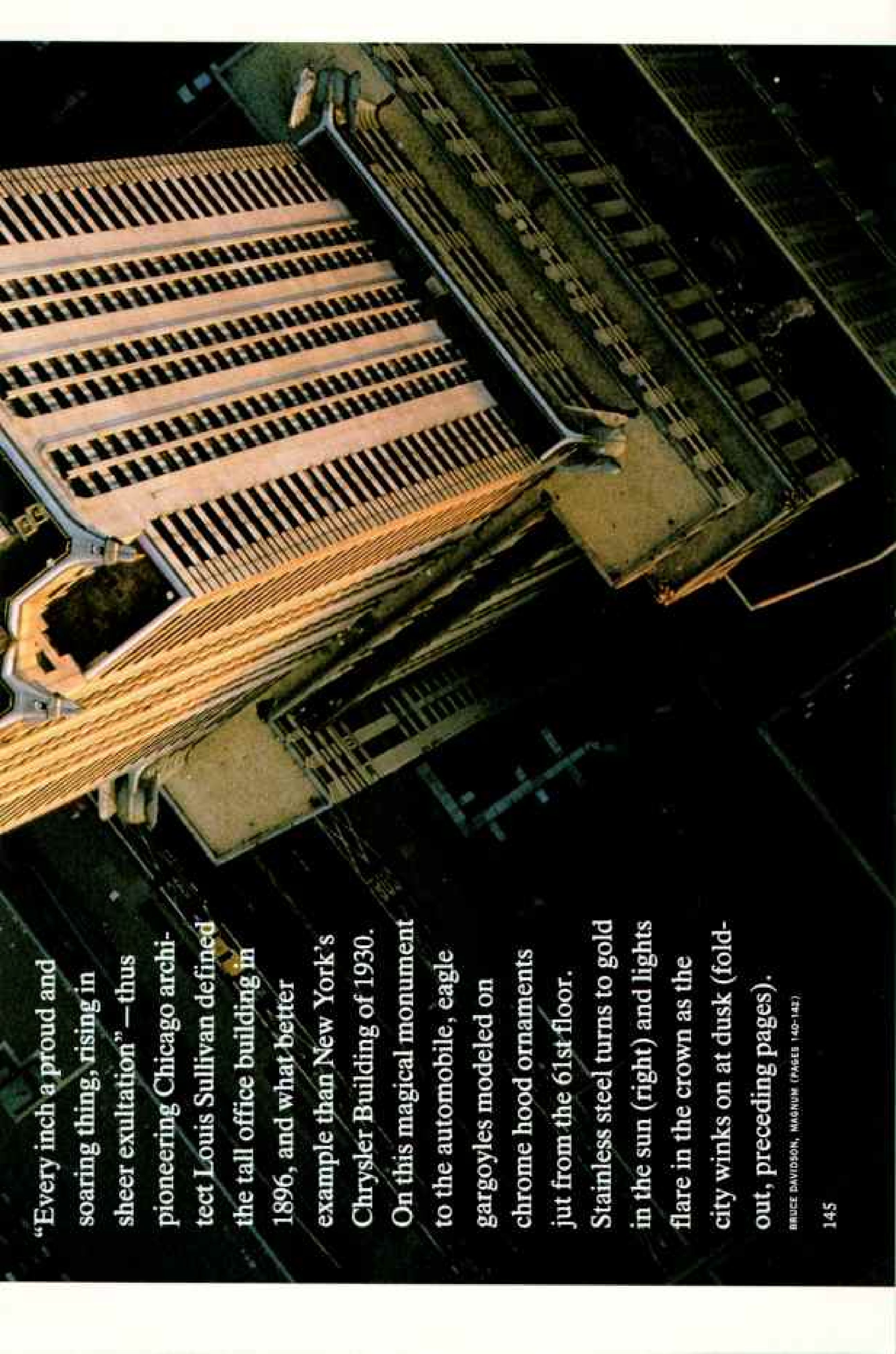


SKYSCRAPERS

BY WILLIAM S. ELLIS ASSISTANT EDITOR

PHOTOGRAPHS BY NATHAN BENN





“Every inch a proud and soaring thing, rising in sheer exultation” — thus pioneering Chicago architect Louis Sullivan defined the tall office building in 1896, and what better example than New York’s Chrysler Building of 1930. On this magical monument to the automobile, eagle gargoyles modeled on chrome hood ornaments jut from the 61st floor. Stainless steel turns to gold in the sun (right) and lights flare in the crown as the city winks on at dusk (fold-out, preceding pages).

BRUCE DAVIDSON, MAGNUM (PAGES 140-142)

F

ROM THE TIME that the elevator doors close and the cage starts to lift, noiseless and with a rush, like a kite on the wind, it takes exactly 70 seconds to reach the 103rd floor of the tallest building in the world. And that is high enough up in the Sears Tower to look out and see the muscled broadness of Chicago appearing in runty submission to the height of the structure.

If not a heroic achievement in design, the Sears Tower, at 110 stories and 1,454 feet, represents an act of wizardry in structural engineering. Indeed, this is a magical time in the evolution of America's urban landscapes, a time of bold (for better or worse), fresh architecture and computer-driven engineering, and a time too of a new generation of skyscrapers rising to be clad in clouds over major cities across the country—Minneapolis, even, and Los Angeles with its ill-defined downtown.

All of this is happening at a time when, paradoxically, organized opposition to construction of sunlight-blocking towers is stronger than ever before. It is too late, however, to reverse the reality that the skyscraper has become the logo for urban development in America; from King Kong to Donald Trump, it has bridged the 20th century with its indestructible, prodigious presence.

Today's skyscraper is a creation of economics and the need to escape the press of horizontal crowding. With raw land in midtown Manhattan now costing more than entire buildings a few decades ago, it is not surprising that developers are

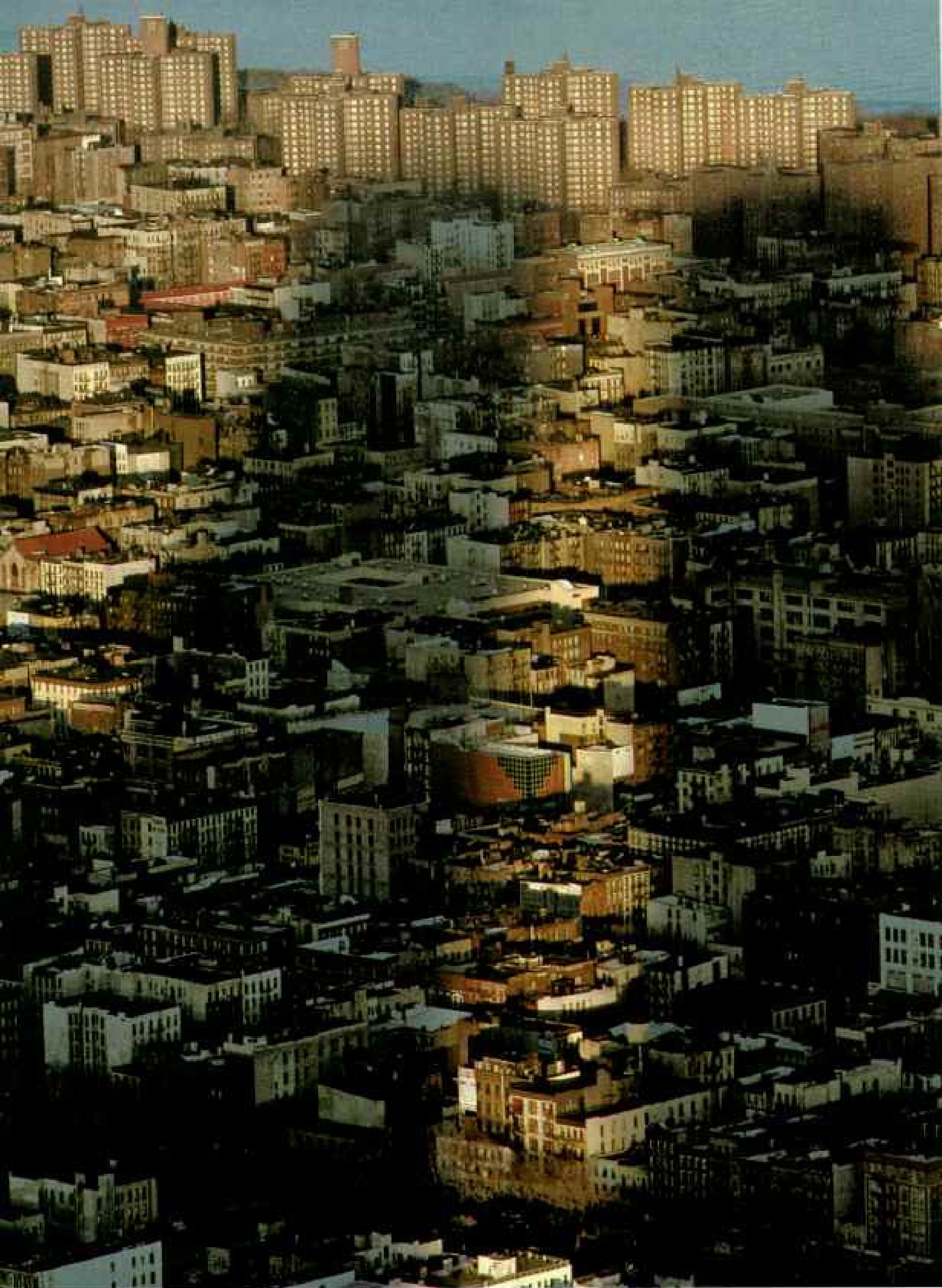
looking upward rather than outward. And (in the right place, in good times) a prestigious new building can attract tenants who will happily pay more than a thousand dollars for each square foot of lofty floor space they occupy.

And when an entire skyscraper is offered for sale, the sum involved can total hundreds of millions of dollars. Last October, for example, it was announced that the Sears Tower would be put on the market, and experts predicted that the selling price would be in excess of one billion dollars, making it the largest single-building real estate transaction in history. *(Continued on page 153)*



A modern curtain wall of glass and limestone graces the 1933 RCA Building. The structure employs a series of setbacks as it climbs 70 stories in New York City's Rockefeller Center. The complex, home of the Radio City Music Hall, covers 22 acres and includes 19 buildings—the tallest being the RCA, number 11 in the key (above) to the foldout on pages 140-142.





"No one sees the sun in New York City," the natives say, but the World Trade Center gives new meaning to living in the shade. On a winter afternoon, shadows of its



twin towers reach two miles toward the East River. Such shadows loom as an issue in the approval process for new high rises in many parts of the country.



ACADEMY OF MOTION PICTURE ARTS AND SCIENCES





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GEORGE EASTMAN HOUSE (ABOVE) AND BELOW



LENN JOHNSON



Playing a starring role in *King Kong* in 1933, the Empire State Building achieved enduring fame. Blond heroine in hand, the giant ape scaled the tower, then the world's tallest. Fay Wray and rescuer Bruce Cabot (top center) were actually atop a ten-foot mock-up in Hollywood, where the action was filmed, using an 18-inch puppet gorilla and a gigantic hand. "I still think the building is a wonder," says Miss Wray, visiting the windy

observation deck for the first time since 1934 (left).

Empire State's promoters called construction "a human adventure." Photographer Lewis Hine dangled in a steel cage to get this view toward the Chrysler Building (above). The steel frame of the Empire State, clad in limestone (top right), rose in 19 months. It proved strong enough to withstand a B-25 bomber that crashed into the 79th floor on a foggy morning in 1945, killing 14.



Towering inferno of fiction became reality for the tallest building in Los Angeles last May. Starting on the 12th floor, an after-hours fire destroyed five floors of the 62-story First Interstate Tower, killing one, injuring 40. A sprinkler system was being installed at the time.

WIDE WORLD PHOTOS

IN ITS MAKING, the skyscraper draws on colossal egos, on financing almost inventive enough to warrant a patent, and on the talents of the world's leading architects and engineers. All else in matters of design and construction pales in comparison to this—to erecting a frame a thousand feet high and then draping it with a curtain of stone or glass, all the while compensating for the winds that play on the upper floors like a pick on the strings of a banjo, and giving to it both beauty and character as well as (lo, the “smart” building is with us) intelligence, and filling the inner cavities with the marrow of serviceability.

And when it is finished and there are souls awash in the pride of it all, the tower then stands as a monument in the service of a bank or an oil company or perhaps a maker of soap. In at least one case of new-generation skyscraper construction, the lofty reach for name recognition was made by an individual.

“Ego is a very important part of the building of skyscrapers,” says Donald Trump. “It’s probably a combination of ego and desire for financial gain. I mean, once you have enough money so that you can eat and live, then ego enters into it. It’s involved with the building not only of skyscrapers but of all great buildings whether they are tall or not.”

The eponymous Mr. Trump is in his office on the 26th floor of the Trump Tower, signing checks as he talks. A large window at his back frames a sweep of cityscape, including Central Park, in midtown Manhattan. At such a height as this the scene should be telescoped to a distant, shimmering fusion of earth and sky, but not here, not where towers rise on almost every block to stand floor to floor to one another and cast down overlapping shadows on the streets below.

“I don’t think the rising opposition to skyscraper construction is totally justified,” Trump said. “Because New York City has done so well, economically, the mood here now is against construction. When the city suffers a downturn—which perhaps it will at one point, although it looks very optimistic right now—then the mood will change to proconstruction. There is another problem, and that is when you build a bad building, it creates a negative impact. When you build a great building—I mean everybody loves the Seagram Building—everyone is for it.”

Clearly Donald Trump assigns his 68-story tower at Fifth Avenue and 57th Street (“the world’s most talked about address”) to the camp of the “greats.” It is the flagship of his real estate empire, ranging from casinos in Atlantic City to a house with 118 rooms in Palm Beach.

“And that,” he said, with an imprecise gesture toward one of the buildings on view from his office window. “The Plaza Hotel. I just bought that.”

Long after one departs the 26th floor and the six-story-high marbleized flume of an atrium, complete with waterfall, the wonder of it all remains—not of Trump’s celebration of power and self but of the realization that construction of such magnitude can take place in the center of Manhattan, along streets at near gridlock with traffic. Somehow, they got 90,000 tons of concrete to the site, along with 3,800 tons of steel reinforcing rods, and they sheathed the frame in reflective

bronze glass and put in enough electrical wiring to reach south to Richmond, Virginia. There were as many as 5,000 workers there to put it all together in just under three years.

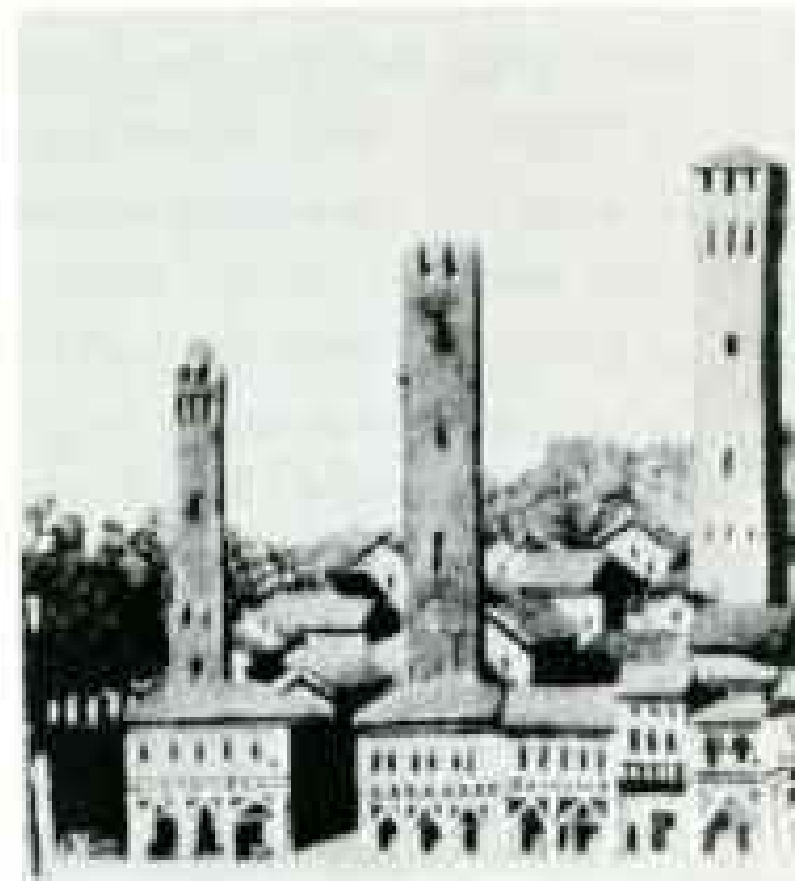
The Trump Tower is but one of several dozen tall buildings erected in New York during the 1970s and early 1980s. Among those is the structure that, more than any other since the early part of the century, lifted interest in building design from the salons of a narrow elite. The AT&T corporate headquarters building, with its distinctive Chippendale top, attracted wide media coverage and, with it, sentiments of love or disdain (like Brussels sprouts, the building brooks no middle ground, only acceptance or rejection).

Certainly, the pigeons knew how they felt about the 200-million-dollar high rise. They flocked to the hundred-foot-high arch over the entranceway, there to roost and defile the stone until they were scared off by a five-dollar plastic owl purchased at K Mart and hung in an air vent above the entrance.

So, pigeonless now, the AT&T tower rises for 37 stories at 550 Madison Avenue, the design work of Philip Johnson and John Burgee, both superstars among today's architects. It is joined in midtown by architect Hugh Stubbins's spectacular Citicorp Center with a crown that slants at a 45-degree angle, and where one of the upper floors has been given over to a 400-ton block of concrete that acts as a "damper" — a computer-controlled hydraulic system allows the block to move around on a slick of oil to counteract heavy winds. It is on the street level, however, that an even more innovative balancing act takes place: The building stands on four massive columns so tall that the first floor is 14 stories above ground.

Unlike the glass boxes of the last generation of skyscrapers (architects classify them as modernist or international) the new towers abound with style and, in many cases, intelligence. In one manifestation of a smart building, electrodes in the windows take readings on the intensity of sunlight, and a computer adjusts the interior lighting accordingly. The temperature in an office can be raised or lowered by dialing certain numbers on the telephone. The planning includes integrated services, such as electronic mail and a central digital telephone switchboard, shared by all the tenants of the building.

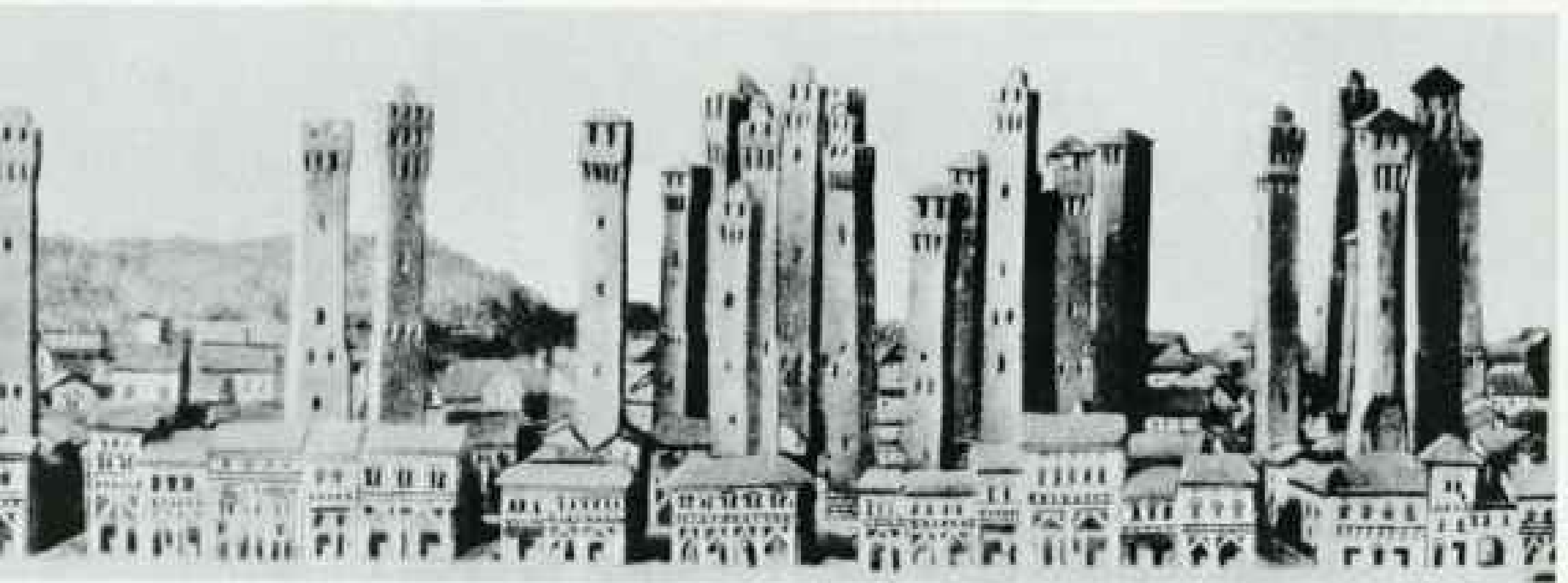
Just one new tall building has given the Philadelphia skyline a fresh look; another has done the same for Atlanta. Seen from the freeways, the skyscrapers of Houston and Dallas mask their oil-bust emptiness with the dazzle of design. But it is in Chicago, birthplace of the skyscraper, that the new architecture — it is called, with a license to set time ahead, postmodernism — has gained the widest acceptance.



Forerunners of today's skylines, towers in 13th-century Bologna were raised by Italian families who fortified city homes to wage war with one another and outsiders. Masonry walls carried the full weight of the towers, limiting their practical height.

THERE IS A VIBRANCY about Chicago today that may or may not relate to architecture, but it is clear that the city, keeper of the finest classic design in the country, has forsaken terra-cotta ornament for the sleek skins of today's towers. More than ever now Chicago seems a city built for speed, though not enough to completely outdistance the past. After all, it was here that the ten-story Home Insurance Building was erected in 1885 (as American phenomena go, the skyscraper is not old), the first structure to use a frame rather than the walls to fully support the vertical load, thus setting down the simplest definition of a skyscraper. For the purposes of fire and other codes, any structure higher than 75 feet is considered to be a high rise.

Occupation of such heights, of course, became practical only after 1852, when



FROM THE SKYWARD TREND OF THOUGHT, MIT PRESS

master mechanic Elisha Graves Otis of Yonkers, New York, invented the "safe hoist" from which today's elevators evolved. The swiftest now move about 20 miles an hour—limited chiefly by passengers' ear discomfort.

It was in Chicago that a man named Louis Sullivan worked, blazing trails of tall building design. He gave artistic form to the skyscraper; in his conviction that "form follows function," he utilized design, structure, and ornament to invest a building with an artistic expression of height.

"Chicago architecture was slow to change when the postmodernists first came in," said Paul Gapp, architecture critic for the *Chicago Tribune*. "It was really the last major city to move away from the international style. But now many architectural firms are working here in the postmodern style."

Among those who came in: William Pedersen, of the firm of Kohn Pedersen Fox. The New York architect brought with him the design of a building that was constructed at 333 West Wacker Drive (pages 160-61). The 36-story tower is skinned in glass and rises from a base of granite, curving in the front to allow for a smooth coupling with its site at a bend in the Chicago River. For this, Pedersen won the 1984 American Institute of Architects' National Honor Award.

Architecture is not a profession where stardom comes easily. Even today, with

Tall, taller, tallest became attributes of modern buildings after the advent of the safe passenger elevator in 1852: made higher stories easily accessible and iron framing (later steel and reinforced concrete) made them stable. But the name skyscraper wasn't applied until the 1880s. The skyscraper developed simultaneously in Chicago and in New York and has since changed the face of cities across America.

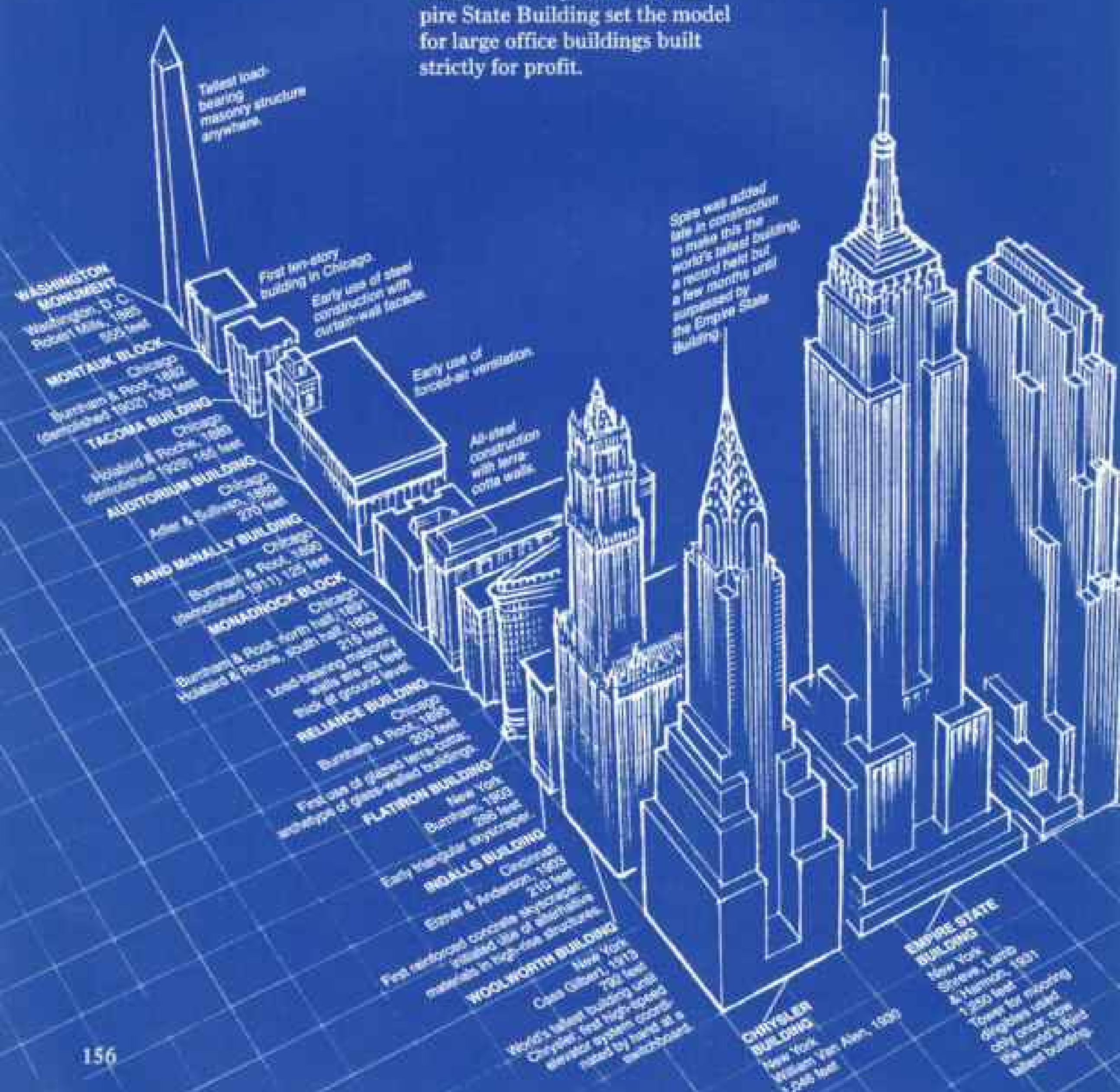
Many early tall office buildings

were modeled on Renaissance palazzi, stretched vertically. Their load-bearing walls rose as horizontal layers of stone or brick, following a tradition from antiquity exemplified by the Washington Monument, still the tallest load-bearing masonry structure anywhere.

By the 1890s steel skeletons were coming into use, carrying a building's weight and freeing its walls to serve as curtains that protected and insulated. Still, architects found inspiration in traditional styles as they built monuments to individuals and corporations, such as Woolworth and Chrysler. The Empire State Building set the model for large office buildings built strictly for profit.

With the development of air-conditioning, buildings became what architect-professor Cesar Pelli has called "complete containers of controlled environments." Glass walls, envisioned as early as the 1920s by German-born American architect Mies van der Rohe, proliferated after World War II. An acclaimed example of the international style, the unornamented glass-walled Seagram Building spawned a generation of imitators.

By the 1980s tall had lost some of its glamour, and many



architects were rejecting the international style. They turned again to historical, ornamental antecedents, as seen in New York's AT&T tower with its controversial Chippendale-like pediment and popular Renaissance-inspired arcade.

Epitomized the post-modern break with the glass box of the international style. Granite curtain wall simulates heavy masonry.

DESIGNED BY WILLIAM H. SOMM, TYPHOGRAPHY BY CHARLES C. SHL, BOTH NATIONAL GEOGRAPHIC STAFF

<p>CA TOWER New York Architects: Skidmore, OWing & Merrill 1955 The tower's 22-story glass curtain wall was the first skyscraper to use a double-glazed system.</p>	<p>SEACONN TOWER New York Architects: Skidmore, OWing & Merrill 1956 The tower's 22-story glass curtain wall was the first skyscraper to use a double-glazed system.</p>	<p>BRITANNIA BLDG. London Architects: Sir John Soane 1795 The tower's 22-story glass curtain wall was the first skyscraper to use a double-glazed system.</p>	<p>JOHN HANCOCK CENTER Boston Architects: Helmut J. Spiller 1969 The tower's 22-story glass curtain wall was the first skyscraper to use a double-glazed system.</p>	<p>TRIBE TOWER New York Architects: Skidmore, OWing & Merrill 1970 The tower's 22-story glass curtain wall was the first skyscraper to use a double-glazed system.</p>	<p>WORLD TRADE CENTER New York Architects: Minoru Yamasaki 1973 The tower's 22-story glass curtain wall was the first skyscraper to use a double-glazed system.</p>	<p>SEAN TOWER New York Architects: Skidmore, OWing & Merrill 1974 The tower's 22-story glass curtain wall was the first skyscraper to use a double-glazed system.</p>	<p>JOHN HANCOCK TOWER Boston Architects: Helmut J. Spiller 1976 The tower's 22-story glass curtain wall was the first skyscraper to use a double-glazed system.</p>	<p>CHINESE GARDEN New York Architects: Skidmore, OWing & Merrill 1977 The tower's 22-story glass curtain wall was the first skyscraper to use a double-glazed system.</p>	<p>JOHN HANCOCK CENTER Boston Architects: Helmut J. Spiller 1978 The tower's 22-story glass curtain wall was the first skyscraper to use a double-glazed system.</p>	<p>JOHN HANCOCK CENTER Boston Architects: Helmut J. Spiller 1979 The tower's 22-story glass curtain wall was the first skyscraper to use a double-glazed system.</p>	<p>JOHN HANCOCK CENTER Boston Architects: Helmut J. Spiller 1980 The tower's 22-story glass curtain wall was the first skyscraper to use a double-glazed system.</p>
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Reaching for the sky

the widespread changes in the cityscapes of the world, the field of major players in skyscraper design is not crowded, and most of the notables are Americans. In addition to Pedersen, others include Philip Johnson, who, at the age of 82, is in a position to have his artistic judgment override economic concerns of the developer, and his colleague, John Burgee. You can add Richard Keating and David Childs, both with the firm of Skidmore, Owings & Merrill; Kevin Roche, Helmut Jahn, I. M. Pei, and Cesar Pelli. All are men with a certain flair, and more than one, for some reason, elects to be shod in loafers with blinding shines.

William Pedersen keeps pencil and paper in his hands as he talks, pausing now and then to illustrate his thoughts. "One of the problems we face as designers of these buildings is that they are just too damn big," Pedersen said. "That's what it amounts to. They are too bulky; they don't fit comfortably into their sites. So what one tries to do by various compositional means is break down the tall building, both vertically and horizontally, into a series of smaller pieces."

If there is a choice to be had, Pedersen would rather design a low building on a site, for then the structure can shape the space. Other architects, and some developers, would like to see the mile-high building become a reality. From an engineering standpoint, it is possible to build that tall, but such a structure is not likely to turn a profit for its owner (costs begin to soar at about 80 stories). Donald Trump has come closer than anyone to putting up a megatower, but, at 150 stories, it would have fallen far short of a mile.

Trump purchased a parcel of land along the Hudson River in Manhattan for 92 million dollars. It was there that he proposed to erect the tallest building in the world, along with other structures. It would be called Television City, and, he hoped, the National Broadcasting Company would become the flagship tenant. At about the same time, a real estate developer and magazine publisher named Mortimer B. Zuckerman was proceeding with plans to erect two large, shadow-casting towers overlooking a corner of Central Park.

FOR MANY RESIDENTS of New York it was already too cold and dark and windy on the streets of their city. They may have imagined how wonderful it was when steeples were the loftiest structures in the towns and cities of America; at one time even in New York nothing matched Trinity Church in its reach toward God. Sunlight fell there then, and those who walked the streets had no need to be conditioned for an environmental adventure.

Just three years after the century turned, a 20-story building went up at 23rd Street and Broadway, a creation of Daniel H. Burnham, who would also design Union Station in Washington, D. C. It was called the Flatiron Building, and the downdraft it created—a rioting of winds at street level—lifted enough skirts to attract crowds of men to the area. It has been recorded that the police responded with firm orders to the oglers to "23 skiddoo," meaning leave 23rd Street.

From there New York moved into a golden era of skyscraper construction with

Spoofing the profession, prominent architects masquerade as their buildings for the 1931 Beaux-Arts Ball in New York City. As the scene suggests, architects, often forgotten by name, live in the public mind through the fame of their creations.

the Woolworth Building in 1913, followed by the Chrysler Building in 1930 and the Empire State the next year. The streets were becoming canyons; the impact of the towers on life in the city became something to be reckoned with. On the street level traffic increased, and so did the anger of the city dweller. In time, crime increased, and, in many cases, the tall apartments became like cells of safe isolation.

The lofty towers brought other costs, not yet measured; what one architect has called a “rapid deterioration in the quality of the working and living environment” imposed by tall buildings—fewer workers with the privilege of window views or even the sight of daylight, for example. Among New York’s high-rise dwellers, one study shows, most children are not allowed out to play by themselves before age ten. At what price to their psychological growth? Some developers are thoughtfully adding a social scientist to the design team.

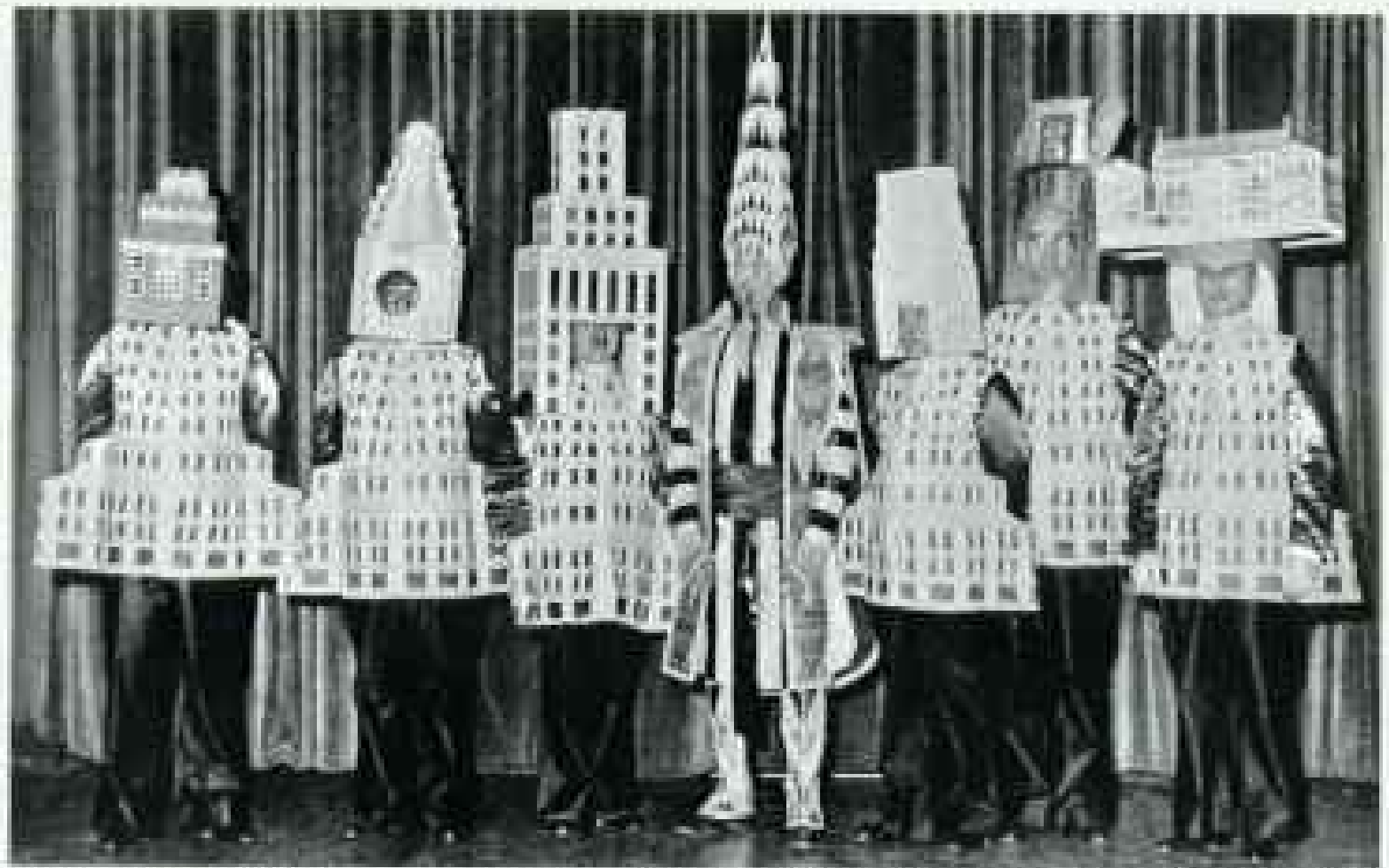
When Trump and Zuckerman unveiled their proposed megabuildings, some New Yorkers rebelled. Court action blocked Zuckerman’s Columbus Circle project as originally proposed. NBC, having tested the rising opposition, announced that it would not move into Trump’s supertall building. Construction has yet to start.

New York agreed to sell Zuckerman the land on which to build his two towers provided he paid a 57-million-dollar bonus to the city and spent another 40 million dollars to make improvements to the subway station adjacent to the site. In return he would receive permission to increase the size of his development by 20 percent over the limit set by zoning regulations. That amounted to about 500,000 square feet, or the size of a 40-story building.

“In effect what the city was doing was selling the zoning regulations,” said Philip K. Howard, a corporate lawyer and vice president of the Municipal Art Society, a leading force for improving the livability of New York City. “We challenged that in court, and it was held to be unlawful.”

Philip Howard came out of the South to fall unashamedly in love with New York, but he knows that city living can become dehumanized when neighborhoods disintegrate and the fun and flavor of it all is lost. What troubles him as much as anything are the residential towers with—deliver him from ever being caught walking on one—plazas.

“We started having these towers built, and they didn’t look like anything that



FROM LEFT: A. STEWART WALKER, THE FULLER BUILDING; LEONARD SCHULTZ, THE WALDORF-ASTORIA HOTEL; ELY JACQUES KAHN, THE SQUIRE BUILDING; WILLIAM VAN ALEN, THE CHRYSLER BUILDING; RALPH WALKER, ONE WALL STREET; O. E. WARD, METROPOLITAN LIFE TOWER; J. H. FREEDLANDER, MUSEUM OF THE CITY OF NEW YORK. PHOTOGRAPH FROM AMERICAN INSTITUTE OF ARCHITECTS.





"This building helps explain one aspect of Chicago's geography," says William Pedersen of his glistening office tower at 333 West Wacker Drive. Its curved wall follows a bend in the Chicago River. Completed in 1983 and one of the first skyscrapers built in Chicago by an outside firm—New York's Kohn Pedersen Fox—the 500-foot-high building wears its reflective glass sheath like a skin. It ranked number three in a 1986 poll of architects' favorite new buildings. Like his early 19th-century chair, here opened as library steps, the West Wacker building, says Pedersen, "can be read several ways."

"Relate to the environment" is a guiding principle for Kevin Roche, whose office building under construction at 750 Seventh Avenue had to adapt to setback and other requirements of New York's theater district. As

had ever been built before," he said. "You have here a building of 30 or 40 stories, but the base only covers about 40 percent of the lot. They were built in neighborhoods, some great neighborhoods, and to do that they tore down storefronts and replaced them with some developer's view of a fancy lobby and a plaza that would appeal to a high-class clientele.

"The stores they tore down were where the people gathered. They were the plazas. We don't have *piazas* in New York. We have a dry cleaner and a bar and a grocery store and a deli. And the neighbors and the people who live there go into those places. They shop, they see each other, they tip their hats, and over the years and the decades you get to know who lives in your neighborhood and you recognize them, and that's fun. But these new towers with their plazas deaden the block, creating a barrier, a moat of lifelessness. This has literally drained the life out of certain neighborhoods, on the Upper East Side, for example."

Howard's vision of the city, then, would have high-rise buildings with full-lot coverage at the base, with stores and shops fronting on the sidewalk, as they do at the Empire State Building. The open, windswept plaza with its piece of sculpture and, more likely than not, display of water (falling, rising, sloshing) is missing but never missed.

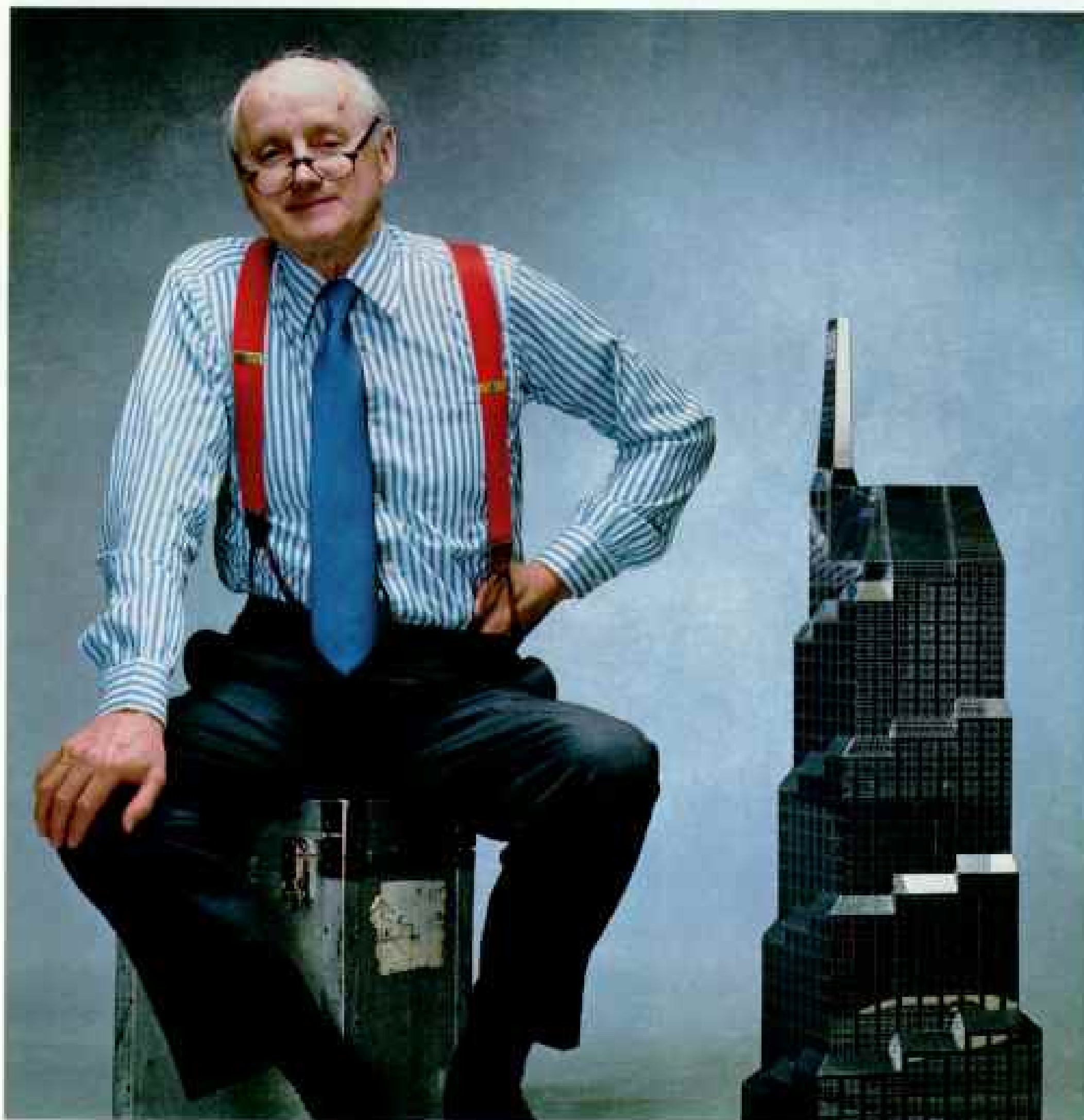
Of more immediate concern is the growing threat of the residential towers overtaking the city's infrastructure. Already there are problems with garbage collection; a truck assigned to a route can take its capacity load at just one building. Some of these condominium towers are like needles, rising to appear like grotesque stanchions for a tent of sky. Such buildings reach 30 stories while having no more than 35 apartment units. By contrast, a proud tower of residential use can become a city, a vertical city, within itself. So it is with the John Hancock Center in Chicago. (See the article beginning on page 174.)

FORTY-NINE of the hundred floors in the Hancock Center—sixth tallest building in the world—are given over to condominiums. There are more than 700 of them. Edward C. Hirschland lives in one and has his business office in another. His daily commuting distance, door-to-door, totals about two feet. "It's terrific," he said of the arrangement, "just terrific. Really comfortable."

For the most part, mixed-use skyscrapers such as this have not been successful. They become capsules, sealing the inhabitants off from each other and the rest of the world. The Hancock Center is somewhat of an exception, in that the building has become a neighborhood in itself. It offers residents a place to park their cars, to eat and sleep, even to vote in their own precinct and buy stamps in their own post office. On Halloween, the children go from floor to floor—spooks in the elevator.

But in this era of new urban architecture and city living, one certainty has emerged: Those who choose to live on, say, the 58th floor of a building such as the Trump Tower, where no unit sells for less than \$700,000, do so in part because they can afford to live somewhere else as well.

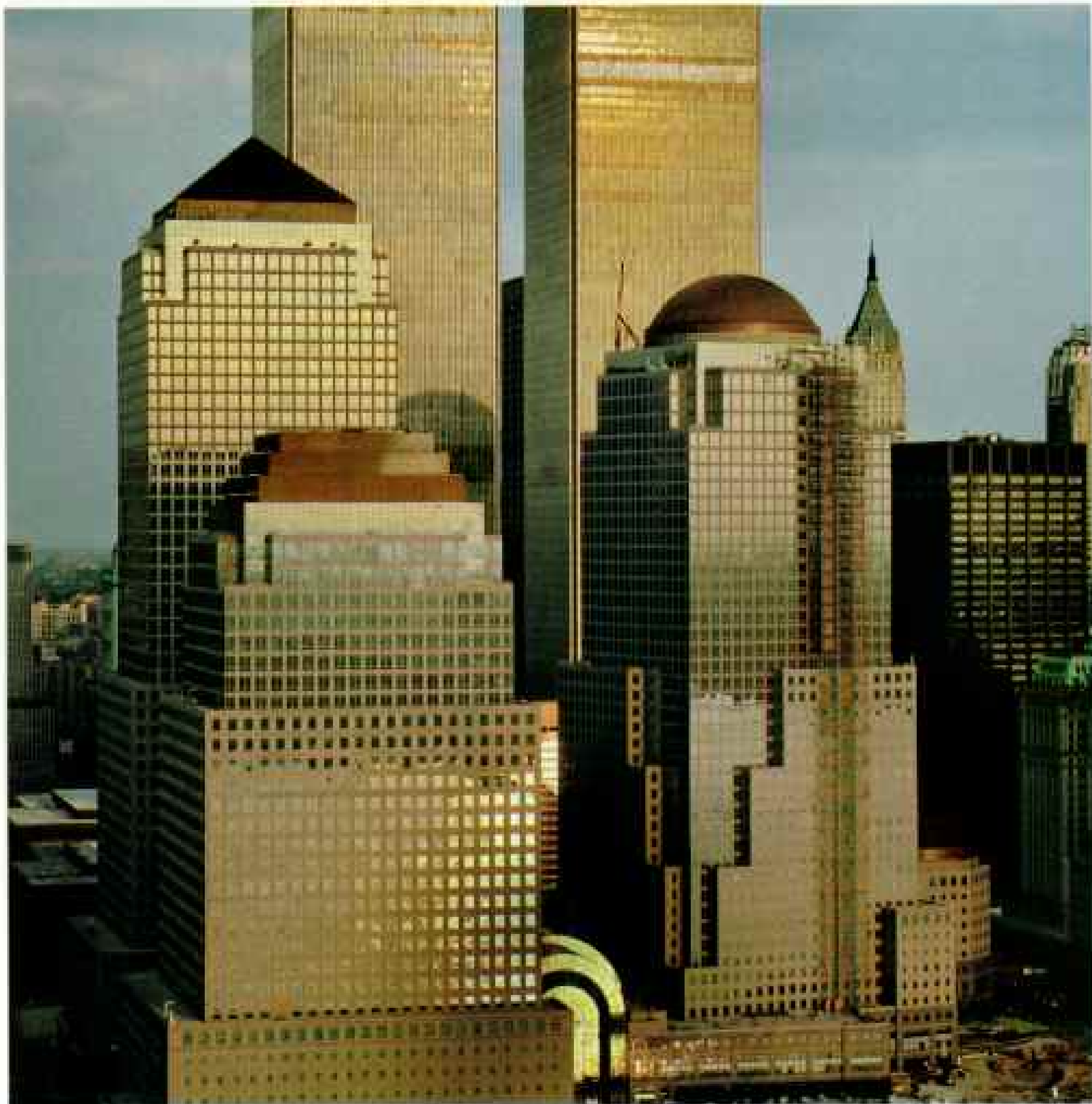
seen in the model, sunlight will catch on the slope of the setback that stairsteps up to the spire, "rather like a ziggurat." At night lower windows will glow with giant advertisements, typical of Times Square.



There is another skyscraper named John Hancock, in Boston. It is 60 stories high, a shining, beautiful rhomboid overlooking Copley Square. In 1973, before its scheduled completion, the building showed signs of becoming a structure under a black cloud. First the windows began to pop out and crash to the streets. All 10,344 panes were replaced. Then, something had to be done to brake the excessive swaying of the building in the wind, so they put in equipment that acted like shock absorbers.

Only recently was its darkest secret revealed: The tower could have toppled over. Despite the addition of the damping feature, the John Hancock Tower was at risk of collapsing in certain wind conditions, and not on its broad face but, astonishingly, on the narrow one—falling, then, like a book on its spine.

The matter was corrected with the installation of additional steel beams, but



"They hold their own," says Cesar Pelli of his World Financial Center (foreground) in Battery Park City. "I have absorbed the World Trade Center towers beyond and made them gentler."

As his buildings rise, window openings become larger until they are "almost diaphanous at the sky. Like sculpture sitting on glass, the cube, pyramid, and dome rooftops, covered in slow-weathering copper, draw the eye upward."





"A skyscraper is an emotional term; it talks about ambition," says John Burgee, who, in association with Philip Johnson, has placed his stamp on the Houston skyline. The slanted roofs of Pennzoil Place, at left, broke from the black box tradition of the international style in 1976. Expanding on the theme, the Republic Bank building features setbacks suggesting the banking houses of early Antwerp.

Taking Philadelphia to new heights, Chicago architect Helmut Jahn designed One Liberty Place with the tip of its spire 955 feet above the street, breaking the city's informal height limit: the William Penn statue on City Hall. "Big buildings are

because of a secrecy agreement ratified by a court, none of this was publicly known until last year, when Robert Campbell, architecture critic for the *Boston Globe*, uncovered the story.

STRUCTURAL ENGINEERING, as it pertains to skyscrapers, has made major advances since then. And the effects of wind, of course, continue to be of vital concern, since a building of 110 stories, such as the World Trade Center in New York, can sway as much as 36 inches at the top. Many of the solutions to the problems come now from research at such facilities as the Boundary Layer Wind Tunnel at the University of Western Ontario in Canada. Dr. Lynn Beedle, director of the Council on Tall Buildings and Urban Habitat headquartered at Lehigh University in Bethlehem, Pennsylvania, cites the importance of computers in the design and engineering of towers today.



"The computer will ask you what intensity of wind you wish to design for," Dr. Beedle said. "Okay, a hundred miles an hour. It will take your preliminary design and tell you how safe it would be in winds of that velocity. If your design is not up to the task, then you have to go back to the—we used to say drawing board, but now it's computer. It can take this sort of partial information and allow you to proceed. It's incredible and, I think, really exciting."

The Council on Tall Buildings and Urban Habitat is concerned with buildings of ten stories or more because that is the cut-off height for fighting a fire from ladders in New York City. "If it's above the tenth floor, they have to go inside to fight it," Dr. Beedle said.

The threat of fire, of course, continues to be the dominant safety concern in skyscrapers. This was reaffirmed last May 4 when one person died and 40 others were injured in a blaze that tore through five floors of the 62-story First Interstate building in Los Angeles. There are few sights more hellish than a sash of fire—flames licking through shattered glass at the high, cool air beyond reach of the fire engine ladders—drawing tight on the girth of a tower. Like many of the high-rise buildings in Los Angeles, the First Interstate building had no operable sprinkler system, and as a result it took about 300 fire fighters almost four hours to control the blaze. Well, lessons were learned. Tall buildings in Los Angeles are now being fitted with sprinkler systems.

There was an engineer named Fazlur Khan, a partner at Skidmore, Owings & Merrill in Chicago. He understood as well as anyone—better, probably—what it

built because they are needed," says Jahn, here in a chair by Mies van der Rohe, proponent of the international style. "My work pushes the limits forward from what Mies did. I consider One Liberty Place is a Miesian building, just more free."



took to build a safe building, a building to stand in defiance of the elements, with muscles drawn tight under cover of smooth skin. He built towers capable of riding out the heaving of an earthquake or the raging of a gale. Among them were the Sears Tower and Chicago's John Hancock Center. He is dead now, but others follow in his steps, making nearly all things possible for building higher and higher with less weight and more strength, like shipwrights leading the way from teak to fiberglass.

In Houston a structural engineer with a string of fine buildings to his name said of Khan, "Just by putting the X's on the outside of the John Hancock Center, he greatly reduced the amount of steel required. He was a genius."

Joe Colaco does much of his engineering work in the South and the Southwest, where the soil often lacks the substance of rock. "In Houston, it's only thick

Cradling his creation, architect Cass Gilbert was carved into the neo-Gothic Woolworth Building of 1913 in this bracket in the building's lobby. Another bracket portrays five-and-dime magnate Frank Woolworth counting nickels, perhaps to pay for his "Cathedral of Commerce."

clay," he said, "and in New Orleans—they won't like me saying this—it's like mush." But that doesn't stop him. Building on the clay, he floats the building, in effect, while the New Orleans mush must be laced with pilings.

However he does it, Joe Colaco is always on the lookout for a better method. He thinks there must be a way to increase the strength of concrete used in skyscraper construction from 14,000 pounds to 20,000 pounds per square inch. He is concerned too with finding better ways to tie a building to the ground in an earthquake zone, and to damp the wind-induced swaying of buildings. Research is being conducted around the world, he said, into the use of rubber pads placed under buildings to absorb movement and steady the building.



Postmodernism has left a strong mark on Houston, mainly because of one man, a developer named Gerald Hines. He is a man of wealth and modesty, a builder of towers not only in Houston but throughout the country. And, like kings of old, he is more a patron of architects than an employer.

Among Hines's buildings in Houston are the Republic Bank Center, rising in three stages to 56 stories with a massive banking hall for a base; the Transco Tower, the nation's tallest skyscraper in the suburbs, and Pennzoil Place, a pair of trapezoids in bronze glass, with sloping crowns, one of the buildings that broke the mold in the new generation of towers. All three are the work of Philip Johnson and John Burgee.

On the 50th floor of the Transco Tower, Gerald Hines sits at a table in his office and eats from a plate heaped with macaroni and vegetables. "I believe," he said, "that the architecture of a building should enhance the city, the skyline, and the well-being of all affected by the structure. Take the Pennzoil building. It was one of the first to say that buildings do not have to be inverted boxes. It has been called the building of the decade."

In all, Hines has completed or has under construction more than 375 projects, totaling in excess of 70 million square feet. He engages good architects and works with them, but he lets them have their way for the most part, for he knows that the results are often going to be heavy with prestige and therefore attractive to potential clients.

Jack Kent Cooke is also the owner of a skyscraper—a very good one. He owns the Chrysler Building, the art deco masterpiece in New York, now 59 years old and still more beloved than any other skyscraper in the world. Cooke, who also owns the Washington Redskins professional football team and a variety of other businesses, paid 87 million dollars for the Chrysler and an adjoining building in 1979. To hear him talk, he would not take a billion for it now.

"Well, I guess of the many material things that I own I'd rate the Chrysler Building as my prime pride and joy," Cooke told me. "It is not only a representative icon of this country, it is world famous."

We talked about how skyscrapers last for generations, how the good wood on the walls of the elevator cages still shines, how the marble and other stone is still fit for the sanctuary of some great cathedral, how it all still rises straight and true. "That's right," he said. "So long as you keep them in pristine condition. The Chrysler Building today is in an equally good, if not better, condition than when William Van Alen, its architect, pronounced it fit for Mr. Walter P. Chrysler to take residence, in 1930."

MOVEMENTS IN ARCHITECTURE come and go (the latest is called deconstructivism, with an emphasis on distortion and fracturing of form) and buildings like the Chrysler, Woolworth, and Empire State survive them all, standing proud in the company of all that's new on the New York skyline, including the twin towers of the World Trade Center. There is nothing in the city as tall as those 110-story structures, where more than 100,000 people come and go on a workday.

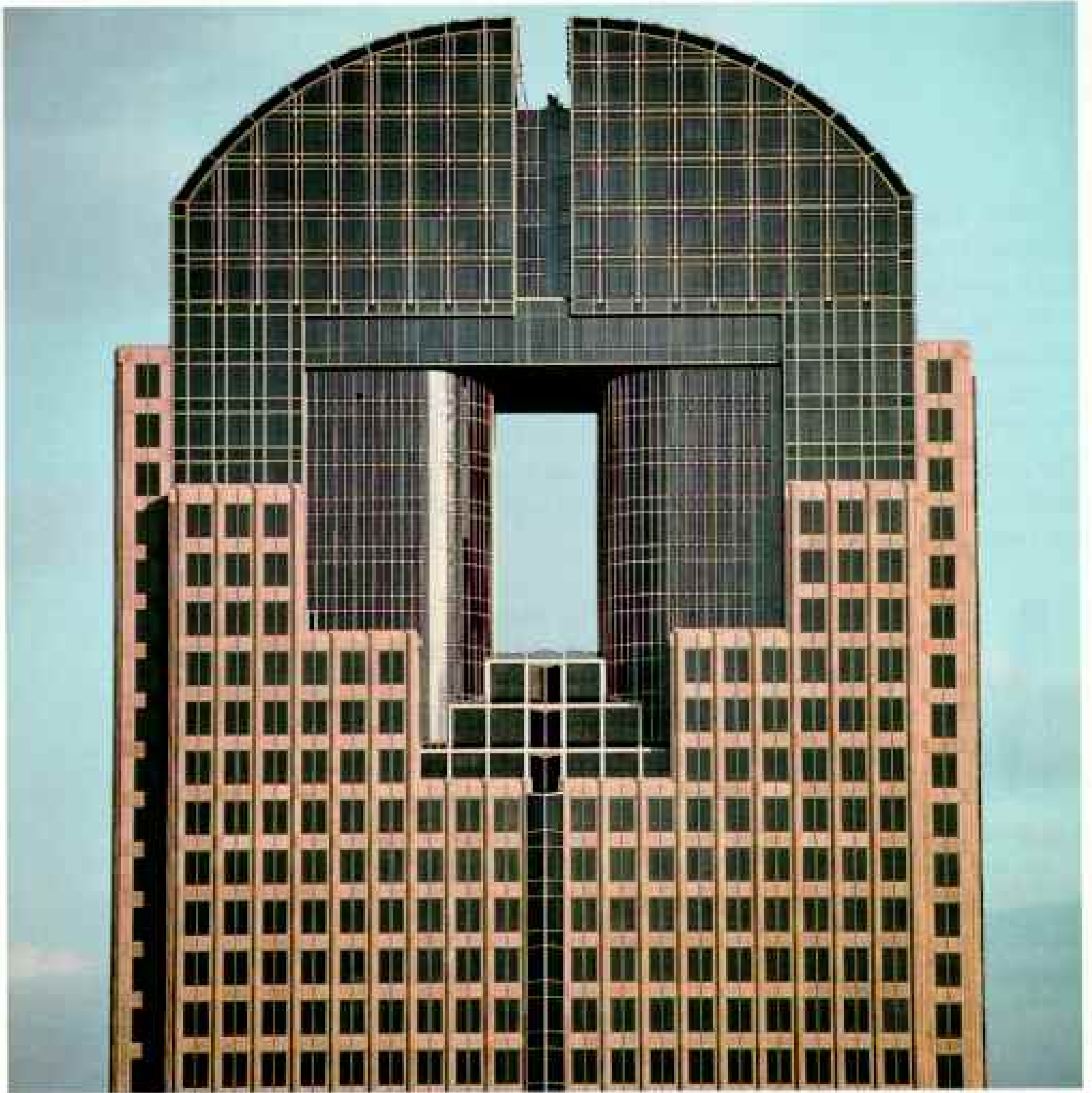
Ah, for Dan Goodwin, they stood there like candy mountains, delicious treats of challenge. So, on a morning in May of 1983, Goodwin started climbing the north tower of the World Trade Center, using suction cups and metal clamps designed to hook into the tracks used for window-washing equipment.

"Spider Dan" they call him, and, true to the name, he was atop the tower in three hours, 18 minutes. "At the 83rd floor, the window-washing track was pulling away from the building," he told me, "and I thought I was going for the big fall." Instead, he went for a ride—to a police station, under arrest.

It remains for an urban mountaineer to visit Philadelphia and be tempted by a building called One Liberty Place. It is the first structure in the city to rise higher than the statue of William Penn that crowns City Hall. It stands in good view from a train approaching the city; indeed, from there, Philadelphia wears a look of compelling freshness because of the 61-story tower designed by Helmut Jahn.

In Pittsburgh the skyline appears like an unfurled scrim when seen upon emerging by car from the Fort Pitt tunnel through Mount Washington. And the tower that looms here is the new PPG (Pittsburgh Plate Glass) Place, a great rise of neo-Gothic design by Johnson and Burgee, sheathed in glass. In Atlanta it's the IBM Tower, and in Dallas the Texas Commerce Tower, among others.

Of all U. S. cities, none is more primed for new skyscraper construction than Los Angeles. "I think Los Angeles has that happy medium between Houston's free-for-all way of doing things and San Francisco's heavy restrictions," said Richard Keating, an architect in Los Angeles with Skidmore, Owings & Merrill. "The planners who are thinking and working here understand that the city can still sustain development, and they don't take simpleminded attitudes about 'let's not have high rises' or 'let's not have any development.'" Nevertheless, Los



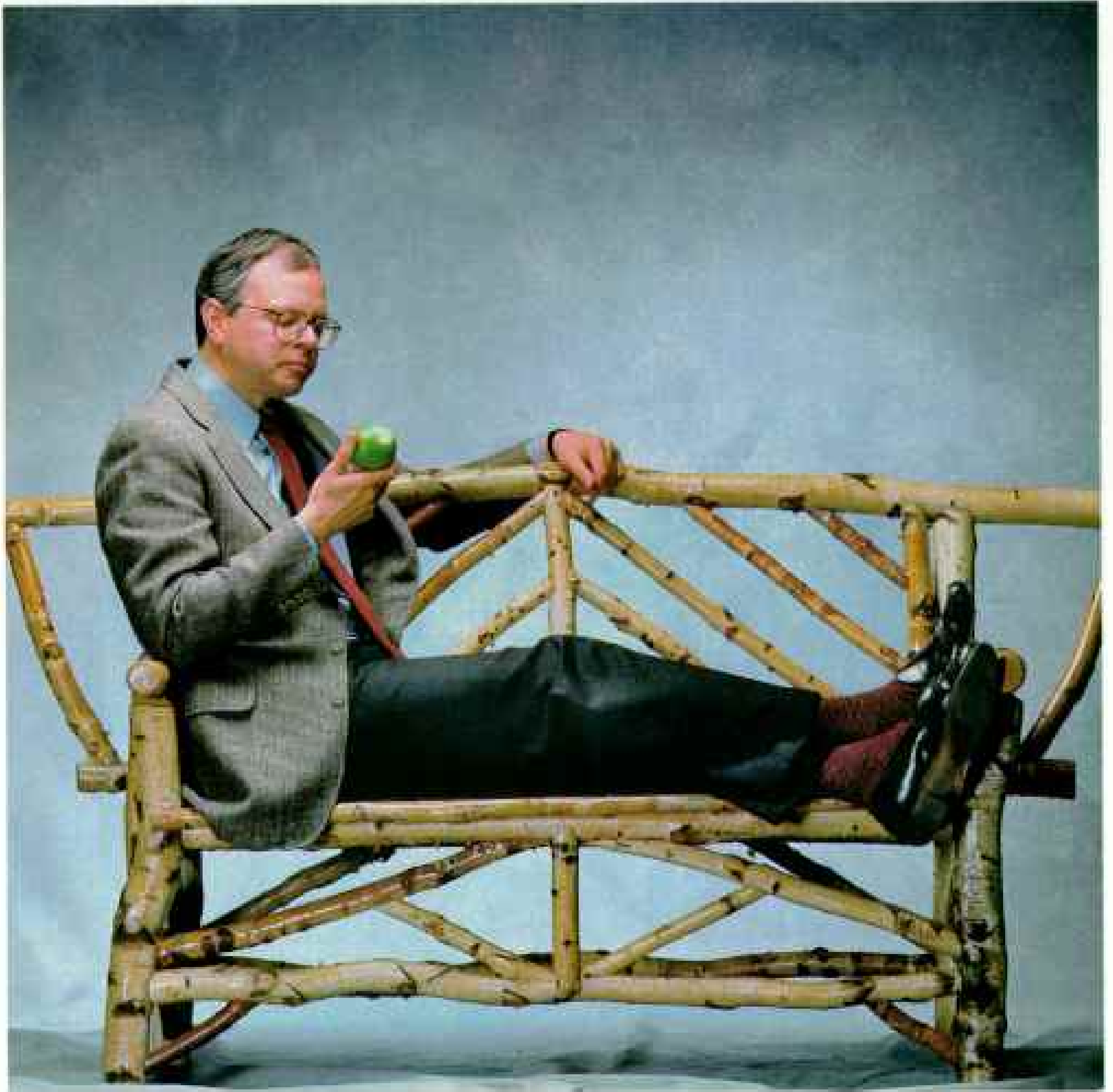
Form follows function even in the seemingly decorative sky window that Richard Keating of Skidmore, Owings & Merrill placed in his Texas Commerce Tower in Dallas. "We had clients who wanted an entire floor, but a small one, so we stacked two six-story towers and then rejoined them in the crown." The sky window, 27 feet wide, makes a distinctive face on the Dallas skyline. Window-washing equipment is stored in the notch of the 55-story building.





"Geometry pursued with rigor" is the way Henry Cobb of I. M. Pei & Partners summarizes his design for the 1986 First Interstate (formerly Allied Bank) Tower of Dallas. Based on the diagonal of a double square, it is a subtractive form, he says—"what's left after carving into a square prism." He reserved half the ground floor for a two-acre water garden, a destination for pedestrians in a city of automobiles.

"Style is not important; quality is," says David Childs of Skidmore, Owings & Merrill, relaxing on a handcrafted Adirondack bench. He designed National Geographic's newest building in Washington, D. C., before becoming chief designer of SOM's New York office.



Angeles has relatively few new buildings of architectural merit that skyscraper designers would call Class A. "But that's about to change, with Harry Cobb's building of 75 stories now going up," Keating said. "That will be the first of the new buildings."

To the north, San Francisco has put such tight limits on building that architects and developers are complaining of overkill. The restrictions stem not from the fear of towers toppling in earthquakes (engineers are solving that problem with shock absorbing technology) but, rather, from the desire to protect the city's unique vistas.

"San Francisco is where the mini-revolt against construction began," said Keating, who practiced in Houston before moving to Los Angeles. "From San Francisco the movement crossed the country, to Boston, and now it's beginning in New York." Among other things, San Francisco has effectively limited new

There his belief that "every resistance makes a project better" will be tested on his Columbus Circle project, a mixed-use complex (below) beside Central Park. An earlier more massive plan by others was criticized by New Yorkers and ultimately rejected.

construction to 475,000 square feet a year, the size of one tower of medium height. It is emphatically in violation of the law too to put up any structure that would cast a shadow over public areas such as parks. Boston and Seattle have adopted similar tough controls. In Washington, D. C., since 1910, the height of buildings has been limited by Congress in order to preserve the city's character of monument-studded openness.

The surge of skyscraper construction in the U. S. seems due to slow anyway; much of it was spurred by the favorable tax treatment given to real estate investment by the 1981 tax law. We are, experts say, overbuilt, and one expects a lull that could last for as long as 20 years.

A spate of empty offices notwithstanding (the World Trade Center took more than six years to fill), architects are fingering drawings of several new "world's tallest" buildings. No doubt some will be built, one to outreach another toward the heavens, as ego and economics collide. "Don't underestimate the romance of the skyscraper," cautions Dr. Lynn Beedle. "It's a powerful motivator."

INDEED IT IS. Consider the person who opens an apartment door on a high floor of the Trump Tower and invites me in for lemonade on a day when heat is pressing through the pores of New York. She and her husband maintain the apartment although their chief residence is in Los Angeles.

If anyone belongs in a skyscraper, it is certainly Fay Wray, star of *King Kong*, the film with a popularity that rides out the passage of time. She sits beside me, an enchanting, gracious woman at the age of 81, and I see her in the gentle grip of the ape, atop the Empire State Building, writhing and screaming. That screaming and Kong's fascination with her, like that of a boy with a firefly in a bottle—remember? Some have said that the film depicted rare sensuality.

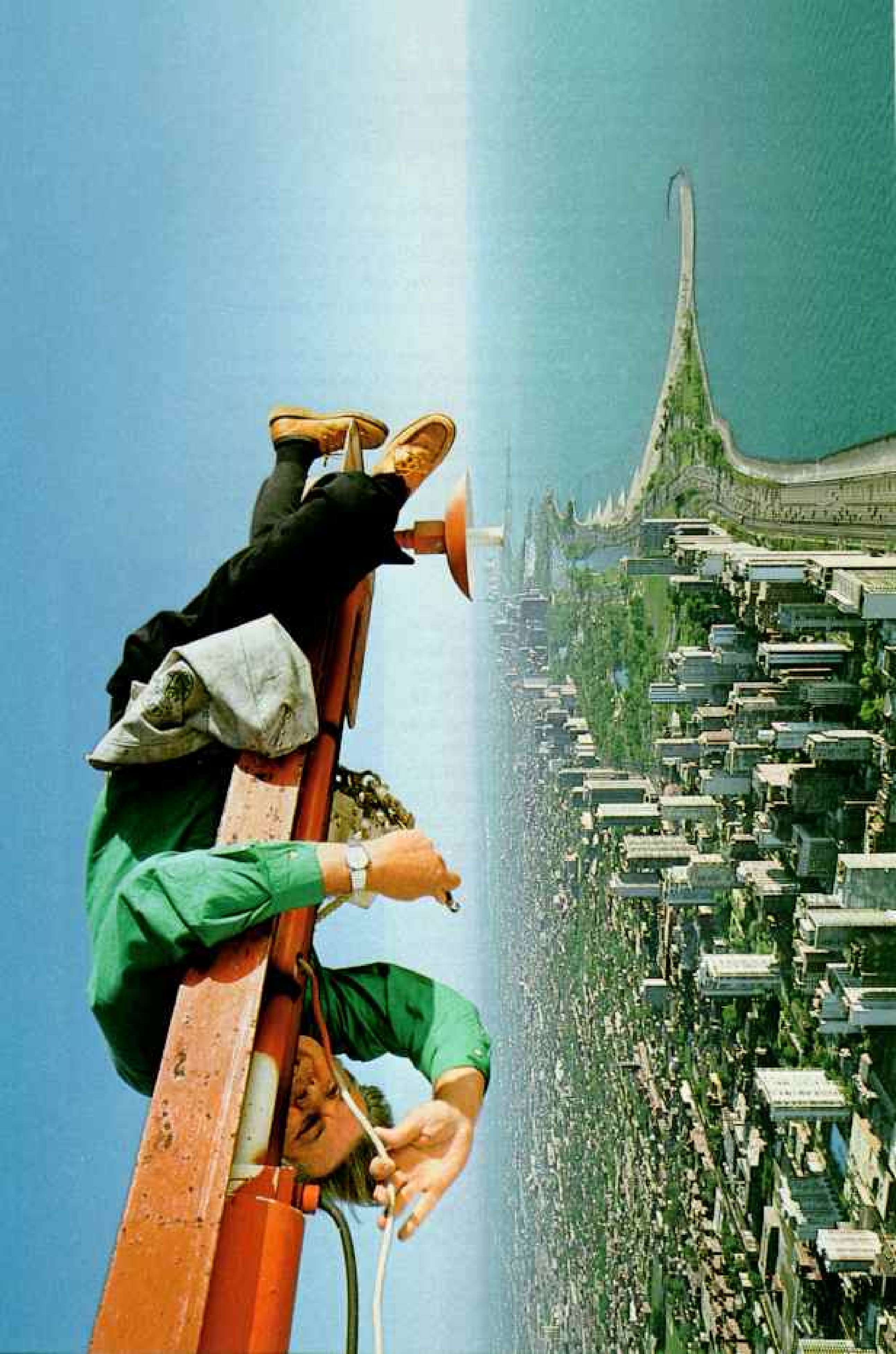
"It was just an adventure piece, plain and simple," Miss Wray said. "That's all. It was not intended to be a horror film, just wild adventure. And the theme was beauty and the beast, of course. But sensual? No."

Fay Wray revealed to me that she had not visited the Empire State Building since 1934, the year following release of the picture. "I feel very possessive about the building," she said. I asked her then if she would go with me to the top of the Empire State, just the way millions of visitors have over more than half a century, and she said she would.

When we got there, to the top, she looked out over the city and then turned back to face the crown of the tower. "This building," she said, "belongs to me." □



SKIDMORE, OWINGS & MERRILL



CHICAGO'S HANCOCK CENTER

TEXT BY A. R. WILLIAMS EDITORIAL STAFF PHOTOGRAPHS BY LYNN JOHNSON

Breathtakingly balanced above the city, Charlie Lo-mas fixes a cable on one of the many antennas atop "Big John"—at 1,127 feet the world's sixth tallest building. In the next block of exclusive North Michigan Avenue, not far from Lake Michigan, stands the castellated Water Tower, survivor of the 1871 fire that cleared the way for the bold architecture characteristic of Chicago.

Shocking when built in the late 1960s, the Hancock

has become a symbol of "the prairie and the lake, the traditions and psyche of the city," says architect Bruce Graham. Its tapered shape provides the floor space needed by shops and offices on lower floors and maximizes windows higher up for the world's most elevated skyscraper residents.

Distinctive diagonals—left exposed on the facade "to tell people it's a tall building," says Graham—brace the structure. Designed to sway 18 inches in a 60-mile-an-hour wind, the Hancock creaks during storms.





I'm encouraging my daughters to be bilingual, bicultural, international people," says Tetsuzo Nomura. Sunday mornings he gathers his family in their 86th-floor living room for lessons in English, social studies, and religion.

Senior vice president of Mitsubishi International Corporation, Mr. Nomura lives and works in the Hancock. Before heading to



his office, he walks around the neighborhood for a "change of mentality."

Once a month he conducts a division business meeting over box lunches from a local Japanese restaurant.

In a 44th-floor exercise room Etsuko Nomura does yoga while daughters Tomoko and Michiyo work out. "I love living here. The views are fantastic, and it's so convenient," says Tomoko.



Leg up by Ryan Holst lets Henry Brownstein hit the top elevator button.

Only about 20 children live in the building—when they reach school age, their families tend to move.

For Ed Hirschland, running stairs is “an all-weather, any-time-of-day sport.” Sunshine finds him jogging along the lake.

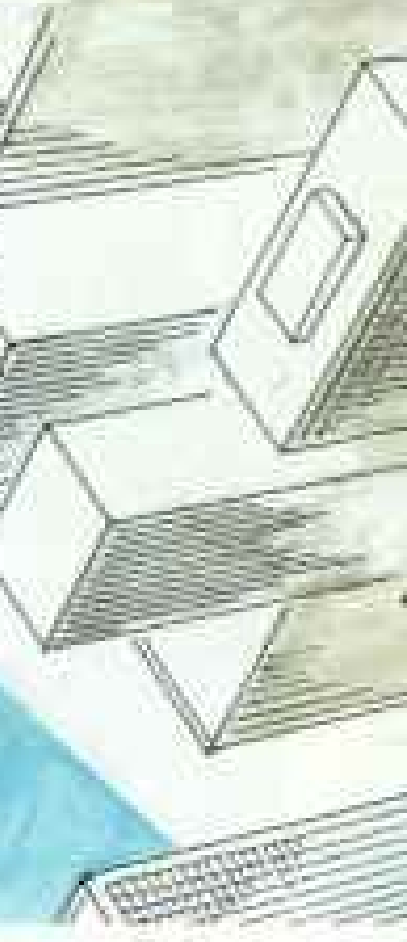


When winter winds bluster, John Hancock Center tenants need never step outside. An elevator ride brings them to most of life's basics—a bank, a post office, a variety of shops, services, and eateries. The 44th-floor sky-lobby grocery store even delivers. Like streets, 50 elevators and five escalators transport the building's 3,500 workers and 1,500 residents. Express cars take half a million visitors to the observation deck each year.

The Hancock uses 600,000 gallons of water every day.

Enough electricity pulses through the 1,250 miles of wire in this all-electric building to power 6,000 homes. The condominium apartments

alone produce several tons of trash a day.



100 ROOF AND ANTENNA FARM

99 MECHANICAL

97 RADIO AND TV STATIONS

96 RESTAURANT

95 OBSERVATION DECK

93 RADIO AND TV STATIONS

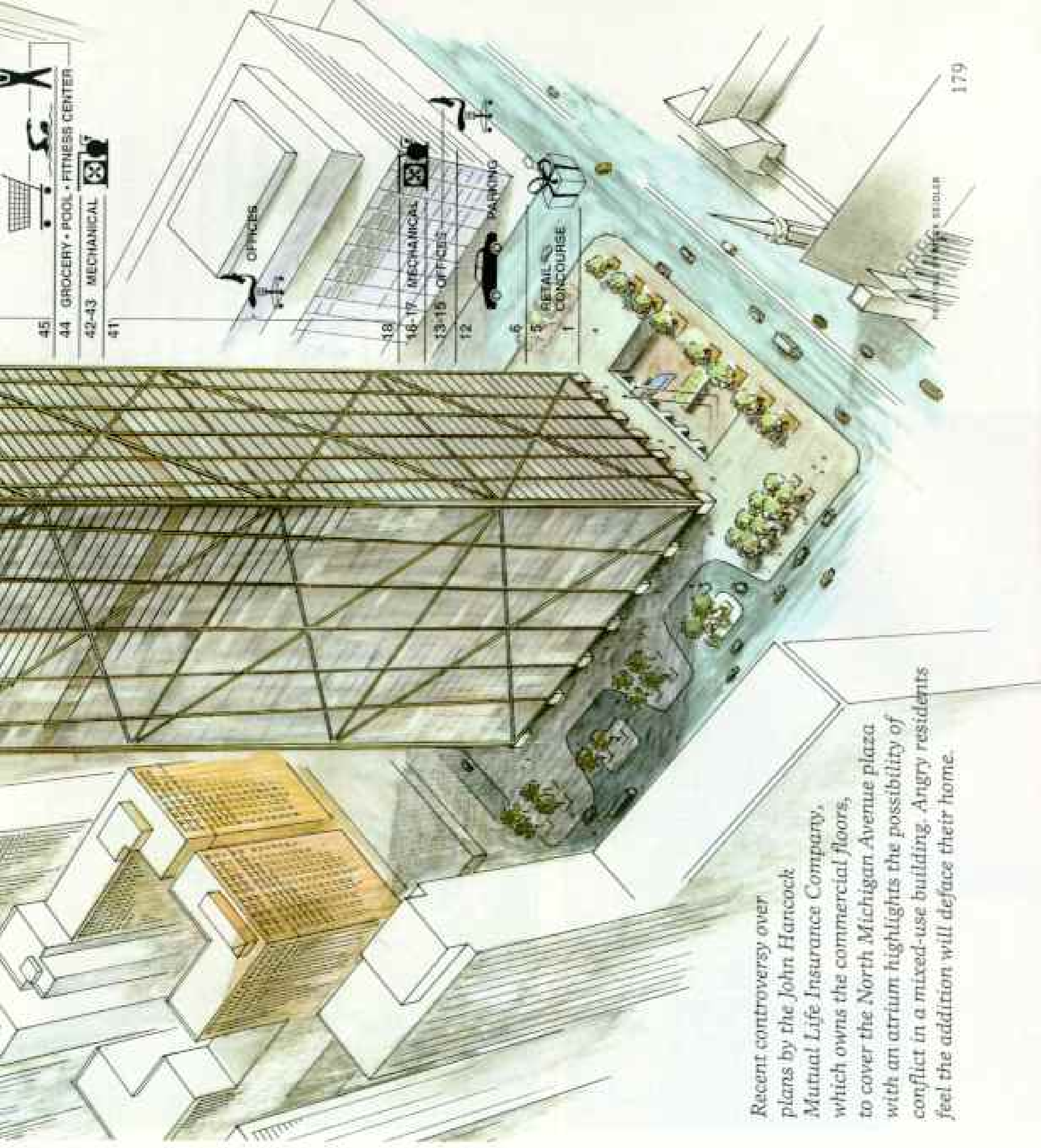
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CONDOMINIUMS



Tomoko Nomura tests morning weather at the lobby door. Other tenants just call the doorman. Temperature, cloud cover, and precipitation often vary from upper to lower floors.



Recent controversy over plans by the John Hancock Mutual Life Insurance Company, which owns the commercial floors, to cover the North Michigan Avenue plaza with an atrium highlights the possibility of conflict in a mixed-use building. Angry residents feel the addition will deface their home.

Relaxed pose reflects the informality of a room Stefan Edlis and Gael

Neeson use as a loft. Small service areas, minimum furniture, and the lack of interior structural supports make their high-rise home a huge open gallery for their art collection, mostly post-war contemporary. Italian artist Francesco Clemente painted the canvas hanging behind them.

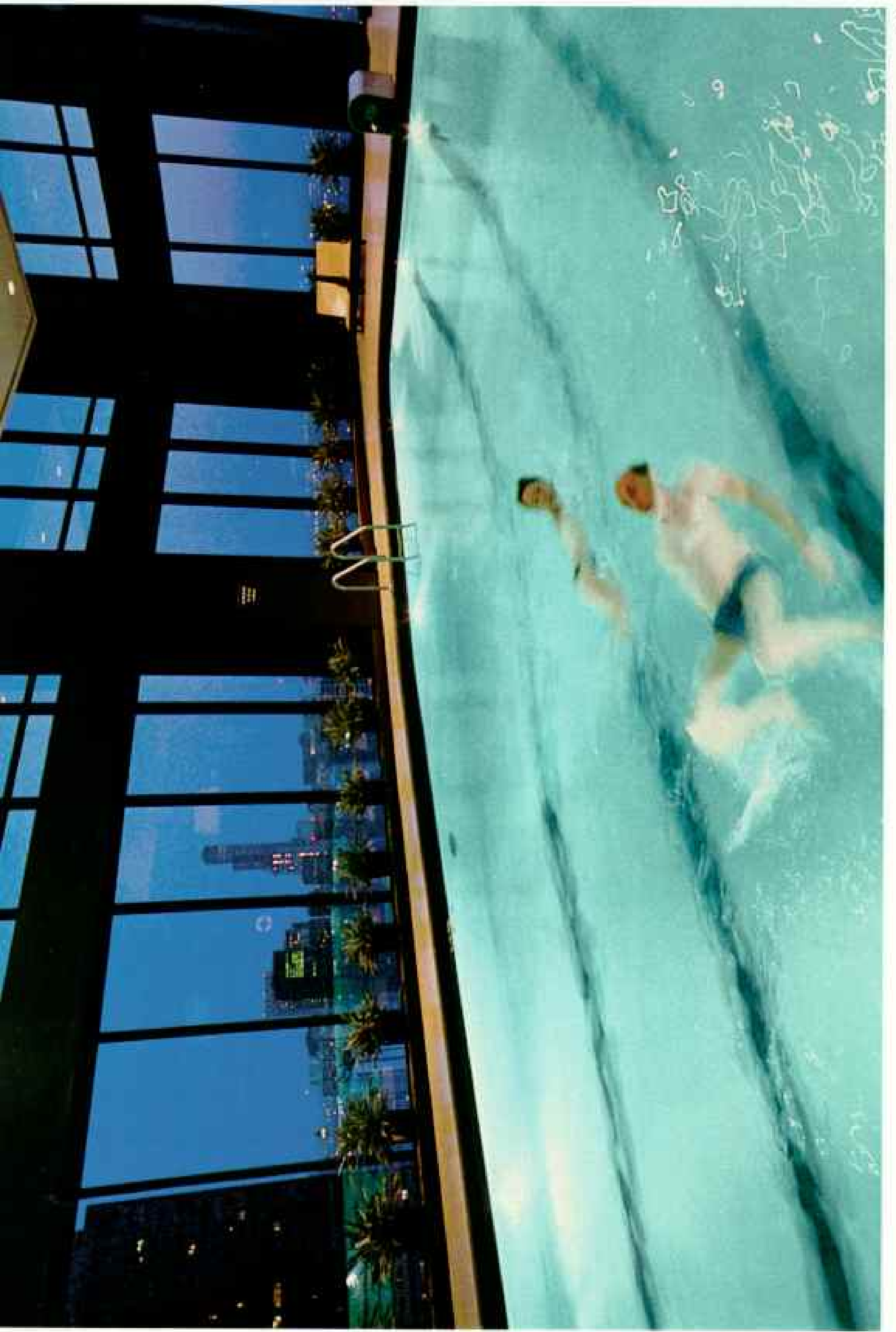
Repositioning a coffee table by pop artist Allen Jones gives it new life. "When you change art around, you look at it differently," notes Gael. "And it's interesting to visit pictures we've lent. They look different in each museum." Before buying, she and Stefan do a lot of research.



"We're always traveling, visiting museums and shows, and meeting with other collectors."

In the pool, among the world's highest above-street level, they share a swim "right at dusk, when lights are just starting to twinkle," says Gael. "That's one of the most beautiful times of day here." During 15 years in the Hancock they have watched clear vistas turn to cityscapes as Chicago grew up around them.

Beginning with a two-bedroom condo on the 51st floor, Stefan and Gael have bought up four adjacent studios and now occupy just under 4,000 square feet. The building has 705 units officially, but similar combinations bring the real number to about 670.



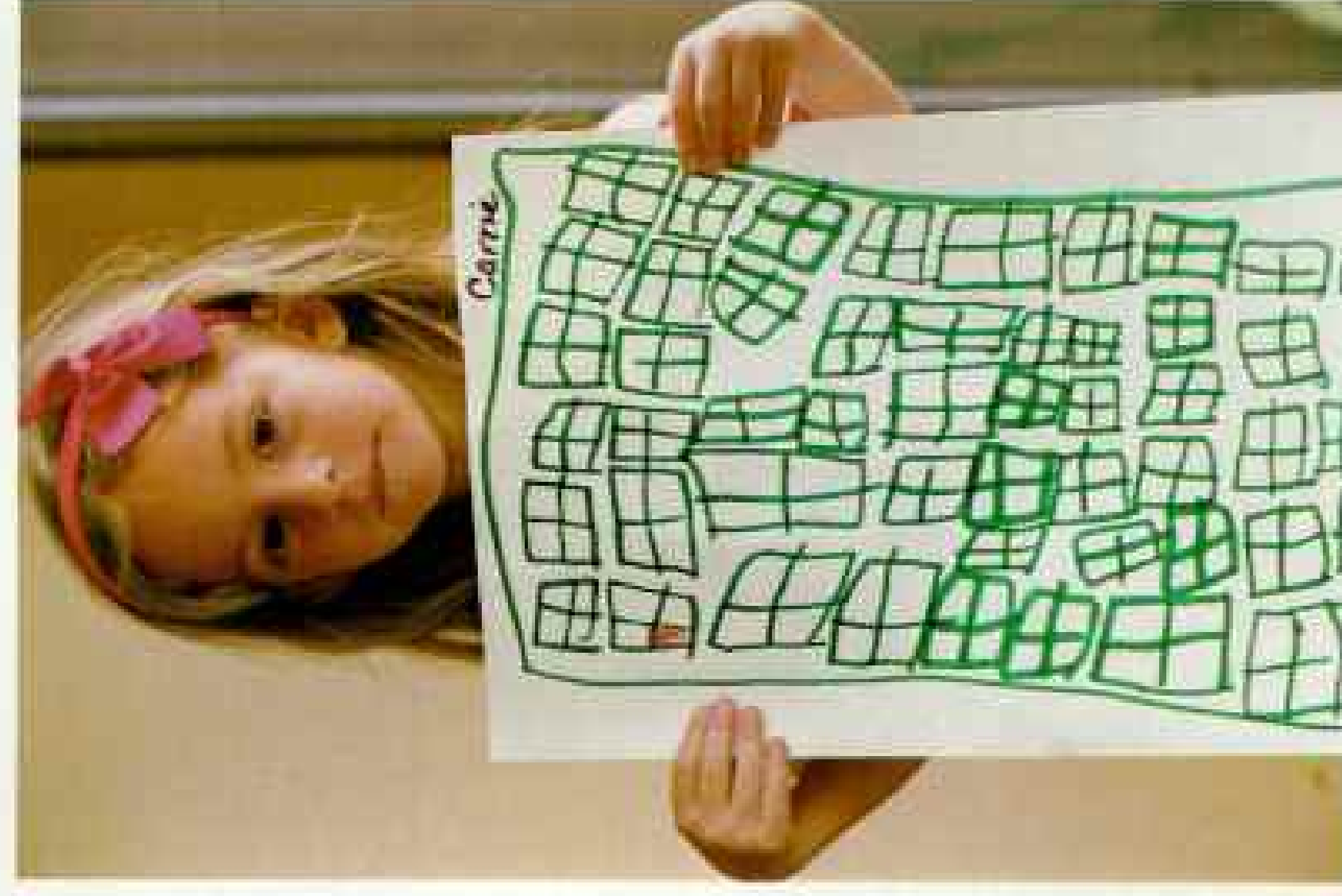


From high in the sky on the 71st floor Ryan Holst (above, at left) and some friends sight the lakeshore

through a telescope. In a picture of their "house" his sister, Carrie, has marked their condo in red. "Raising children here

takes a lot of parent participation," says their father, Darryl, but by eliminating a commute from the suburbs, he and his wife have more

time for family activities. Doorman Charles Satterfield gives young residents a ride through the lobby on his luggage cart.





Day after day Phillamena Cannon cleans the already spotless 91st-floor flat of a man who often travels to California for business. "I always knock," she says. "I never know if he'll be there." However long they spend away, owners make up 90 percent of Hancock residents. Many go south for the winter.

Phillamena has worked here for almost 20 years. When people began to move in, "they were still building," she remembers. "It was all boards and noise."

Betty Lou Taradash keeps things casual when niece Dayle and nephew Gary visit for the weekend (right). "If the kids want to eat in the living room, I spread out a picnic cloth," she says. At night she rolls out sleeping bags for a slumber party.

A real estate broker with

an office downstairs, Betty Lou often has listings in the Hancock. She showed a one-bedroom condo to a suburban doctor (right), who bought it as a town



house. Like other tenants, he and his wife are happy here. "It's a romance," says Betty Lou. "You have to match the right people with the property." □



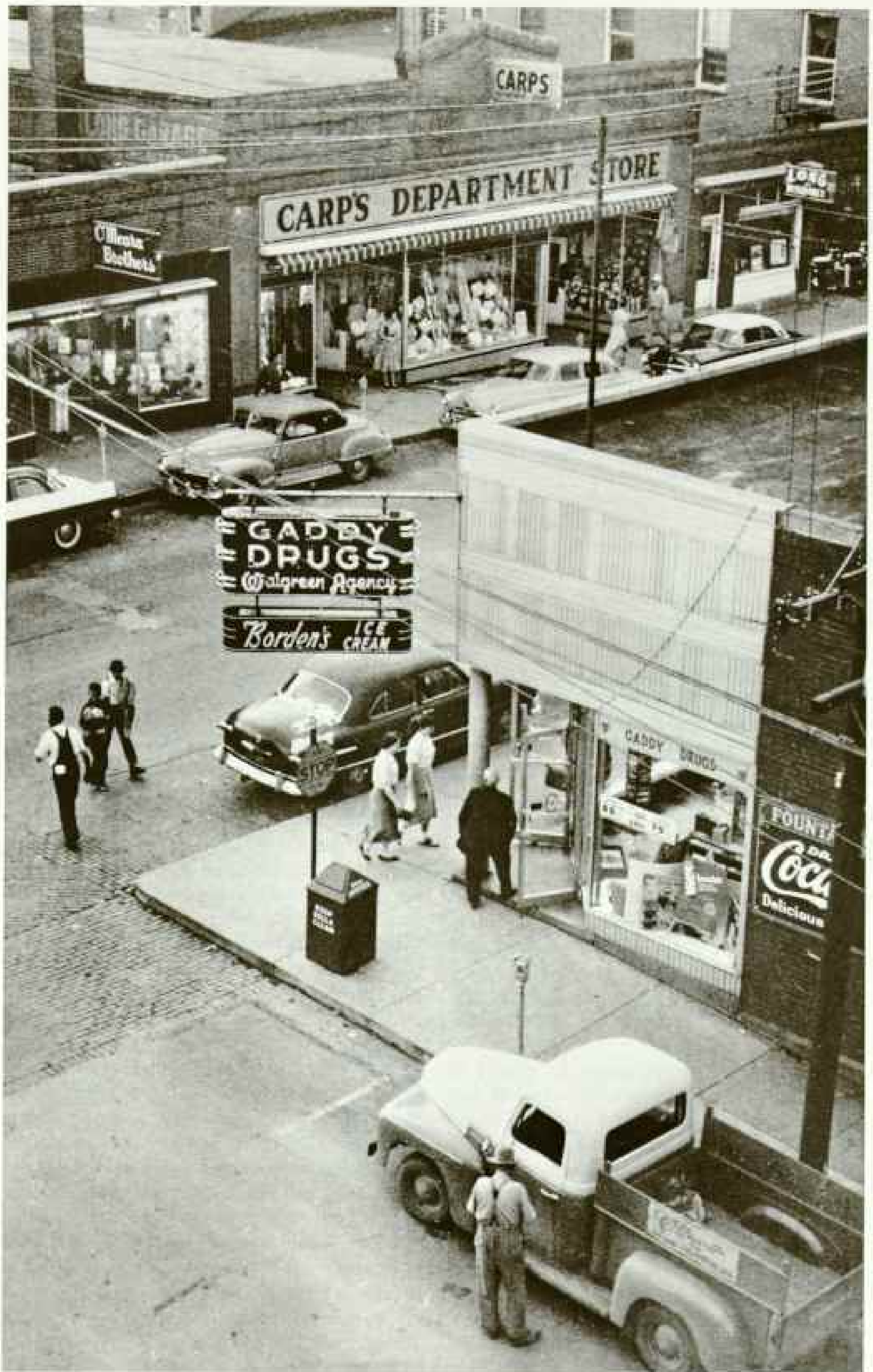


SMALL-TOWN AMERICA

AN ENDANGERED SPECIES?

By GRIFFIN SMITH, JR.

A beloved memento of togetherness gets a careful dusting in the home of Florence Hook in Clinton, Missouri. Across the state in Rolla, a view of Pine and Main Streets chronicles a day in 1955, when a shopping trip to Carp's might end with a soda at Gaddy Drugs. Both businesses are gone now, victims of huge discount marts. Chain stores, interstate highways, the demise of the family farm—all play a part in the changing face of the nation's small towns. Author Griffin Smith, Jr., ruminates on the innocence of the past, the fragility of the present, and the uncertain future of these places. Photographs from the archives of the University of Missouri's Photo Workshop chronicle life in bygone years.



STEVE WOOD (ARROW LEFT); JAMES L. GRANT

AS I DROVE through the farming country of northern Missouri one evening last November, the night was blanketed with silence. Along my route just two places blazed with light. One was the white frame Christian church in tiny Mooresville, where through clear uncurtained windows I saw a dozen worshipers joined in song. The other was Casey's General Store on the highway outside Hamilton—a quick-stop, gas-and-go chain grocery stocked with videocassettes, open until eleven o'clock for anyone who cared to rent a movie. The old and the new: the small town as we remember it and as it may become.

Small-town life has always held a special place in Americans' affections. "Crime is scarcely heard of," Thomas Jefferson said, enumerating the village virtues of the new republic, "breaches of order rare, and our societies, if not refined, are rational, moral and affectionate at least."

Even more than that other great mythic American experience, the frontier, our memories of small towns are laced with warm nostalgia. "The people who lived in the towns were to each other like members of a great family," Sherwood Anderson wrote fondly about his childhood days before the turn of the century. "A kind of invisible roof beneath which everyone lived spread itself over each town. Beneath the roof boys and girls were born, grew up, quarreled, fought, and formed friendships with their fellows, were introduced into the mysteries of love, married, and became the fathers and mothers of children, grew old, sickened, and died. . . . under the great roof every one knew his neighbor and was known to him."

We remember small towns as places of contentment and stability—of volunteer fire departments and town bands, of gazebos on the main square, of courthouses and barber-shops, of horses and hitching posts, of general stores and county fairs and choir practice and moonlight walks; places where people had a sense of common purpose and shared values, and the constable always knew which boys were sneaking cigarettes.

Their very isolation provided a sense of security. "The town waited for you," recalled Henry Seidel Canby, the editor of *Saturday*

Review from 1924 to 1936. "It was going to be there when you were ready for it. Its life seemed rich enough for any imagination. . . . You belonged—and it was up to your own self to find out how and where. There has been no such certainty in American life since."

That lost certitude exerts a powerful hold on our consciousness even today. At Chicago's Museum of Science and Industry an exhibit called "Yesterday's Main Street" was first opened in 1943. A walk-through portrayal of life in a turn-of-the-century small town complete with working shops, it is now one of the museum's most popular exhibits, attracting more than 425,000 visitors a year.

There is, of course, another side to the story. A quick cure for excess sentimentality about small towns is to talk to someone who has actually lived in one. They will tell you of the lack of privacy, of the occasional self-righteousness and meanspiritedness, of the urge to conformity that is the dark obverse of values shared. In Edgar Lee Masters' *Spoon River Anthology* (1915), an aspiring actress reflects on the town's failure to understand her dreams. "In all this place of silence," she laments, "There are no kindred spirits." In *Main Street* (1920), Sinclair Lewis looked at fictional Gopher Prairie, Minnesota, and dismissed it as "tediousness made tangible."

Even Thornton Wilder, whose play *Our Town* (1938) is among the most loving portrayals of small-town life, did not lose the chance to poke gentle fun at the irrepressible boosterism. The town historian informs the audience that Grover's Corners lies atop Pleistocene granite. "It's some of the oldest land in the world," he adds. "We're very proud of that."

GROUNDED in 19th-century ways of life, small-town America reproduced itself across a continent. Examine the counties on a map of the United States, and you will find these basic units of American self-government remarkably uniform in size across the country's eastern half. That is no coincidence; they were commonly drawn just big enough for any farmer in his horse-drawn wagon to reach the county seat and return home in a day—about a 20-mile round-trip.

It was just such a trip that NATIONAL

GEOGRAPHIC Editor Wilbur E. Garrett recalls taking often in the late 1930s as a boy at his uncle's farm near Dederick, in southwest Missouri. "The place was between Nevada and El Dorado Springs," he remembers. "In the morning we loaded up the wagon and packed a lunch. The kids piled in the back, and the aunts and uncles got on the seat. We rode for hours down dirt roads, then on gravel, and for the last few miles there was pavement." The family spent the whole day in town—adults shopping, children exploring. "They always gave us a dime to go to the theater," he says.

Out West, when the open spaces finally became too great and counties were laid off to larger scale, people devised novel ways to cope with distance; the German settlers in the Texas Hill Country built midget "Sunday houses" in town so that the necessary day-trip to church could be lengthened into two.

For generations small towns were the dependable constants of the American scene. But no longer, or at least not in the old familiar ways. In the 20th century small-town America has been caught in a whirlwind of social and economic change.

Statistics tell part of the story. The small town reached its zenith in 1910, when 17.5 percent of Americans lived in communities with populations of less than 10,000; that figure has declined ever since (to 11.2 percent in 1980). By 1940 over half the nation lived in metropolitan areas of more than 50,000.

Farms were the economic reason for being for most small towns, and their numbers diminished by a million between 1960 and 1970 alone. A resurgence of growth in small-town America during the 1970s (when only 460 of the country's 2,400 nonmetropolitan counties lost population) has proved short-lived; about half the nonmetropolitan counties have lost population since 1983.

These statistics speak of effects, not causes. Behind them lie deep changes of technology and economics, of mind and attitude. Together they stole not only the small town's purpose but its innocence as well.

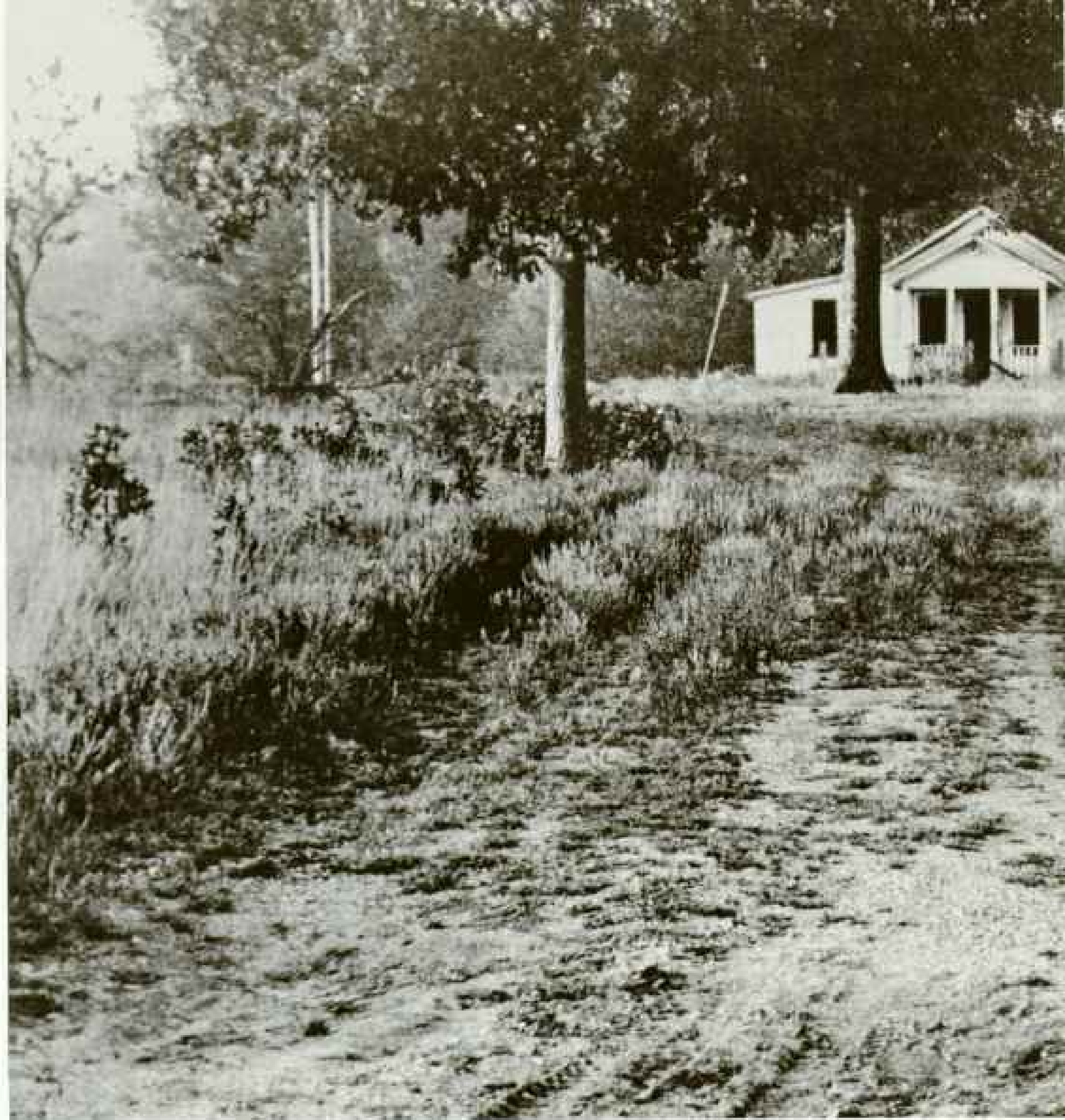
People felt the ambivalent lure of the great cities. For some they held the promise of jobs; for others they offered what Michael Lesy calls "an almost heavenly radiance of change and refreshment." In his classic study of late

THE MISSOURI PHOTO WORKSHOP

ONE OF THE GREATEST collections of photographs of the Middle West, 4,500 pictures produced by the Missouri Photo Workshop provide an invaluable documentation of the changing scene in the small towns of heartland Missouri. For each of the past 40 years one of those towns—from the Ozark hills to the riverbanks of the Mississippi to the broad farmland reaches (map below)—has for one week been the focus of professional photojournalists from around the world. Each turns an imaginative, artistic eye on housewives and hunters, barbers and blacksmiths. The images they produce often elevate the mundane to the sublime.

This continuing archive is preserved by the University of Missouri's School of Journalism—the first established in the United States. Missouri, first land-grant and state university west of the Mississippi, celebrates its 150th anniversary this year.





19th-century Black River Falls, Wisconsin, he found that many who chose to abandon the rigid order of small towns did so to escape responsibility rather than to gain it; they "came to the cities not . . . to get work but to be entertained, not to be masters but to be charges."

Then there was World War I, a sudden opening to the outside world whose impact can be seen most forcefully by simply comparing the contents of a 1914 issue of a small-town newspaper—my Grandfather Smith's *Soliphone* of Paragould, Arkansas, will do—with the contents of that same paper in 1917. In

GRIFFIN SMITH, JR., who grew up in Little Rock, Arkansas, has often written about American places for NATIONAL GEOGRAPHIC.

1914 the news concerns are church suppers and temperance drives and local crops and politics; the advertisements promise goods that are "the best in Greene County." By 1917 the editor is reporting from the front in France and merchants describe their offerings as "the best in the country" or "the world." As a result of the war millions of Americans went for the first time beyond the horizons of their towns; in a real sense they could never quite go home again.

And everywhere there came to be automobiles and paved highways. Together these banished the historic logic of the small town—the day's ride in the wagon—and freed the farmer to shop at lower prices in more distant



VERONICA E. MORRISON

cities. Before long the townspeople themselves began to follow suit.

The photographs of the Missouri Photo Workshop (see Editor's Page) catch small towns composing themselves in the long twilight, just as this great whirlwind has passed. In them we can still recognize ourselves, but we know things will never be the same again.

TODAY SURVIVAL HAS COME easiest to those small towns that have devised new purposes for themselves. Places like Forsyth, Missouri, and Mountain Home, Arkansas, which attract urban retirees, have unexpectedly renewed their lease on life. Others, like Lee's Summit, Missouri,

WEST PLAINS 1971

HHeading back to the house, an Ozark dairy farmer hauled empty ten-gallon cans from the roadside after the daily pickup by a milk truck.

and Georgetown, Texas, which lie within a half-hour radius of metropolitan areas, have enjoyed an influx of commuters who combine small-town living with city jobs.

Fayette, Missouri, a town of 3,500 well off the beaten track in the central hills, surprised me by its vitality. There is a small Methodist college there, but that alone did not seem to account for the sense of pride and polish in the place. I got an explanation from Walter Schroeder, a professor of geography at the University of Missouri in Columbia, 25 miles away. "Fayette is becoming a 'dormitory town' for young professionals who work here," he said. "It's full of gorgeous Victorian houses with ten-foot ceilings—the sort of thing they love. And they can buy them for a song."

Still other small towns, fortunate enough to find themselves beside an interstate highway, make a modest living attending to travelers' needs. For the rest—for the quintessential small towns that framed whole lives from birth, to marriage, to old age and death—the future is far less sure. More than larger cities they have difficulty surviving the economic pressures of hard times. Vulnerable to the collapse of oil prices or the farm-belt drought, they lack the resilience to bounce back.

What matters most is jobs and the will to survive. Chillicothe, Missouri, a farming town of 9,000 people far from any interstate, has both, in proportions great enough to warm the heart. I strolled down Washington Street, past the Ben Bolt Theater, a movie house that was not only still in business but was also fine enough to grace a much larger town; past the courthouse where a carillon given by the Staton Abstract Company was peeling out its morning concert; past the Adams-Baker insurance agency, where passersby did not fail to wave a greeting to the folks inside.

New jobs have come to Chillicothe from a sheet-metal factory, supported by an Industrial Development Corporation and a bond issue. And in a twist that sociologists seem not yet to have fathomed, the new discount store on the highway was explained to me by one young resident not as a threat to local merchants but as a sort of civic status symbol, proof positive that Chillicothe was a successful town. "We have a Wal-Mart," she said proudly. "Hamilton doesn't have a Wal-Mart."

Missouri's Highway 5 bisects the state from north to south. To drive it is to take a snapshot of Missouri small-town life today. Browning,

Laclede, Brookfield, Marceline, Keytesville, Glasgow, Fayette, Boonville, Lebanon, Hartsville, Ava, Gainesville: Some are thriving, some are death masks; some are spruced up, others are ulcerated; still others are forested with For Sale signs. Interspersed between them are the ubiquitous rural convenience stores that have in many ways supplanted the old market towns themselves.

Now their fates depend on luck and simple courage. Custodians of a vanishing America, who could fail to wish them well?

YET WHAT SEEMS GONE NOW, irretrievably so, is the old innocence. When I consider what has changed, it is not the satellite dish or the cable



beaming the Super Bowl that comes first to mind; nor the black-and-yellow Neighborhood Crime Watch signs in Boonville ("If I don't call the police, my neighbor will"); nor the Manhattan-style spray-can graffiti splattered on Glasgow's library wall; nor the videocassette stores whose racy films surpass the vividest gossip of a bygone day.

Instead it's the "Sho-Me Shopper," an advertising broadsheet that circulates in more than 30 towns in northern Missouri. Leafing through it, I came upon a feature called "Back to Basics Cooking." Pot roast and homemade bread? No, the Recipe of the Week was angel-hair pasta with snow peas in Chinese sauce, stir-fried in a hot wok.

What would Gopher Prairie think of that?

HANNIBAL 1957

A collector of men as well as merchandise, Bill Hudnall's used-furniture store once served as an informal social center in this Mississippi River town, the boyhood home of Missouri's most beloved writer, Mark Twain.

PHOTOGRAPHER UNKNOWN





SIKESTON 1958

Making the most of his acreage, a farmer plowed right up to the stoop of an abandoned house in the bootheel of Missouri, site of some of the nation's richest farmland and the state's only cotton-growing area. A woman used a one-wheeled cultivator to turn the soil in Hermann, a center of Missouri's substantial German-American population.

HERMANN 1951



PHOTOGRAPHERS UNKNOWN



CINA SPENCE





HERMANN 1951

Taking the air, members of a sewing circle met at First and Market Streets in Hermann. Their stitches marked time while their husbands attended a debate concerning a forthcoming local election. Enjoying his freedom, Carl Wood (left, third from left) joined his friends passing the time of day on a Forsyth park bench. Nine years earlier, Wood stood trial for murder after he shot his wife's lover in a church. Sentenced to six months for manslaughter, Wood told his attorney, "The jury . . . gave me six months for disturbing the church."

FORSYTH 1950

WEST PLAINS 1971



With a look full of promise, waitress Rhonda Asher gazed fondly at her husband, Sonny, at the Suds 'N' Drive-In restaurant in West Plains. For Jack and Agnes Lambeth of rural Forsyth (right), the promise of devotion remained fulfilled through 60 years of marriage. As Agnes readied another nail, Jack shod a rancher's horse held by their son Donald.

"People brought horses to us by the truckload," Agnes says of the blacksmith shop once run by her husband, now deceased. "We had more business than we could handle."





RICHARD BENJAMIN

FORSYTH 1976



PHOTOGRAPHER UNKNOWN

SALEM 1968



CATHERINE ORSILLO

A student's misfortune drew a laugh from Salem Junior High School principal Virgil Parker (facing page). "He couldn't very well back out of the classrooms all day," said Parker, who drove the boy home for a change of clothes.

In Warrensburg a child got a comforting pat on the head before being sent home because of illness. A group of children playing in a Poplar Bluff park made for a candid portrait reminiscent of the style of painter Norman Rockwell.

WARRENSBURG 1974



SCOTT ELLIOTT

POPLAR BLUFF 1985

FORSYTH 1984

Postman *Ralph Banks* delivered a pointed reminder for a dog to keep its distance on a front porch in Chillicothe. Near Forsyth a license plate states the zip code for McClurg, population six, where postmaster *Lester Adams* tends the window in his general store.

CHILLICOTHE 1963





ART HANLEY



PHOTOGRAPHER UNIDENTIFIED



LEBANON 1978



WILLIAM JIMBCHA

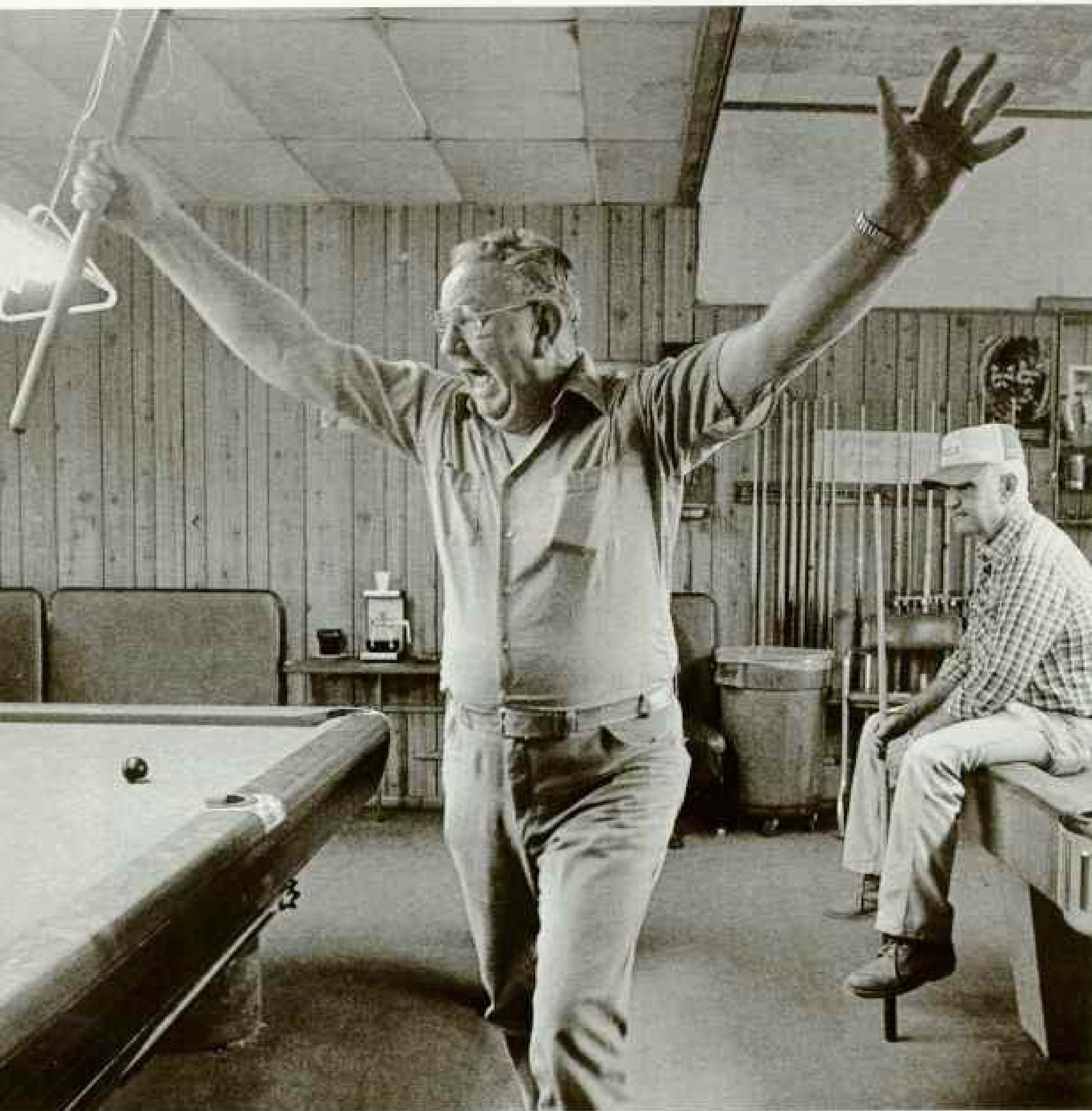
Maintaining the hierarchy of the household, Dorothy Nelson cooked meals alongside her butler, handyman, and friend, Adolph Ford, but dined in a separate room. Reading the *Call*, a Kansas City-based black newspaper, a Mexico resident learns of the historic U. S. Supreme Court decision that banned segregated schools.

MEXICO 1954



PHOTOGRAPHER UNKNOWN

MOUNT VERNON 1983



BOONVILLE 1953



WILL LINDBQUEST



JIM LARNEY

Euphoric Homer Dunton sank a difficult shot as his opponent, Junior Buffington, looked on. Regular games at the Mount Vernon recreation center, Dunton recalls, “gave us retired fellows something to make us get up and put on our shoes and get out.” A lack of male partners didn’t stop two girls from cutting the rug at a hangout frequented by Boonville teenagers.



JESSE EDING



MONETT 1979

A car, a country road, and a six-pack provided the social setting for teenagers outside Monett. Taney County sheriff's deputy Dorothy Peterson disdainfully examined a leaf of marijuana, a plant that grows wild in Missouri. The lack of business was welcome news for police officer Samuel Highshew, who relaxed in Chillicothe City Hall.



PHOTOGRAPHER UNKNOWN



JENNIFER WERNER

FORSYTH 1976

CHILLICOTHE 1963



JOHN H. SHEALY, II

KIRKSVILLE 1973

High-stepping mule cleared a fence under the tutelage of Max Harsha, who trained the animals for coon hunters. During a chase a hunter would dismount and climb over the obstacle as the mule jumped it, then remount and continue the pursuit. Squirrel tails signaled a successful day at a hunting club near Nevada. Even in cultivated areas, rural Missouri harbors a wide variety of birds and other game.

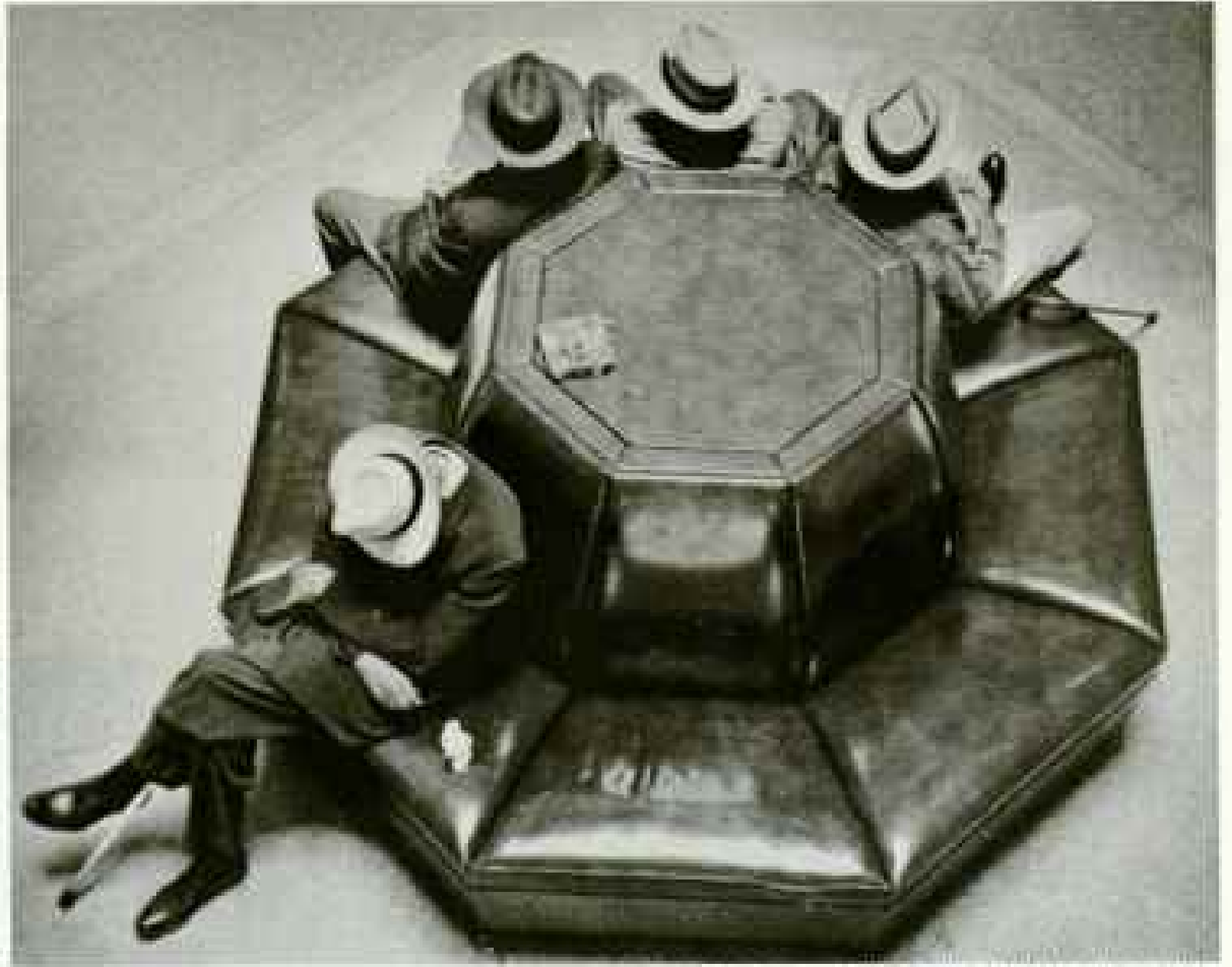


GERARD BENENE

NEVADA 1975

Practicing the fine art of lounging, menfolk in Mexico availed themselves of an octagonal couch at the county courthouse. A familiar pattern in small towns, diagonally parked cars surrounded the town square in Clinton. A running board dated the vintage car of a man stocking up on beer in Boonville.

MEXICO 1954



PHOTOGRAPHER UNKNOWN (ADDED); ANNA MOORE BUTCHER

CLINTON 1982





PHOTOGRAPHER UNKNOWN

BOONVILLE 1953



KIRKSVILLE 1973



BETSY K. FRAMPTON

Inspiring an impromptu hoedown, horseshoer Paul Straight played the Jew's harp as Rusty, Laddie, and Lonnie Harris danced at the Harris farm south of Kirksville. Far from the attractions of the big city, rural Missourians remain as self-reliant in play as they are in work. □

*The Life
and Times of*
**WILLIAM
HENRY
JACKSON**

*Photographing
the Frontier*

Trains helped push the frontier west, and William Henry Jackson's cameras showed them in action—here snaking along the Denver & Rio Grande line in Colorado's San Juan Mountains. He added color for lithographic printing by the Detroit Publishing Company, in which he held an interest.

An artist, veteran of Gettysburg, Oregon Trail bullwhacker, world traveler, and writer, he lived 99 active years spanning dynamic changes in his nation and matching the first century of the new science called photography.

COLORADO HISTORICAL SOCIETY

By **ROWE FINDLEY**

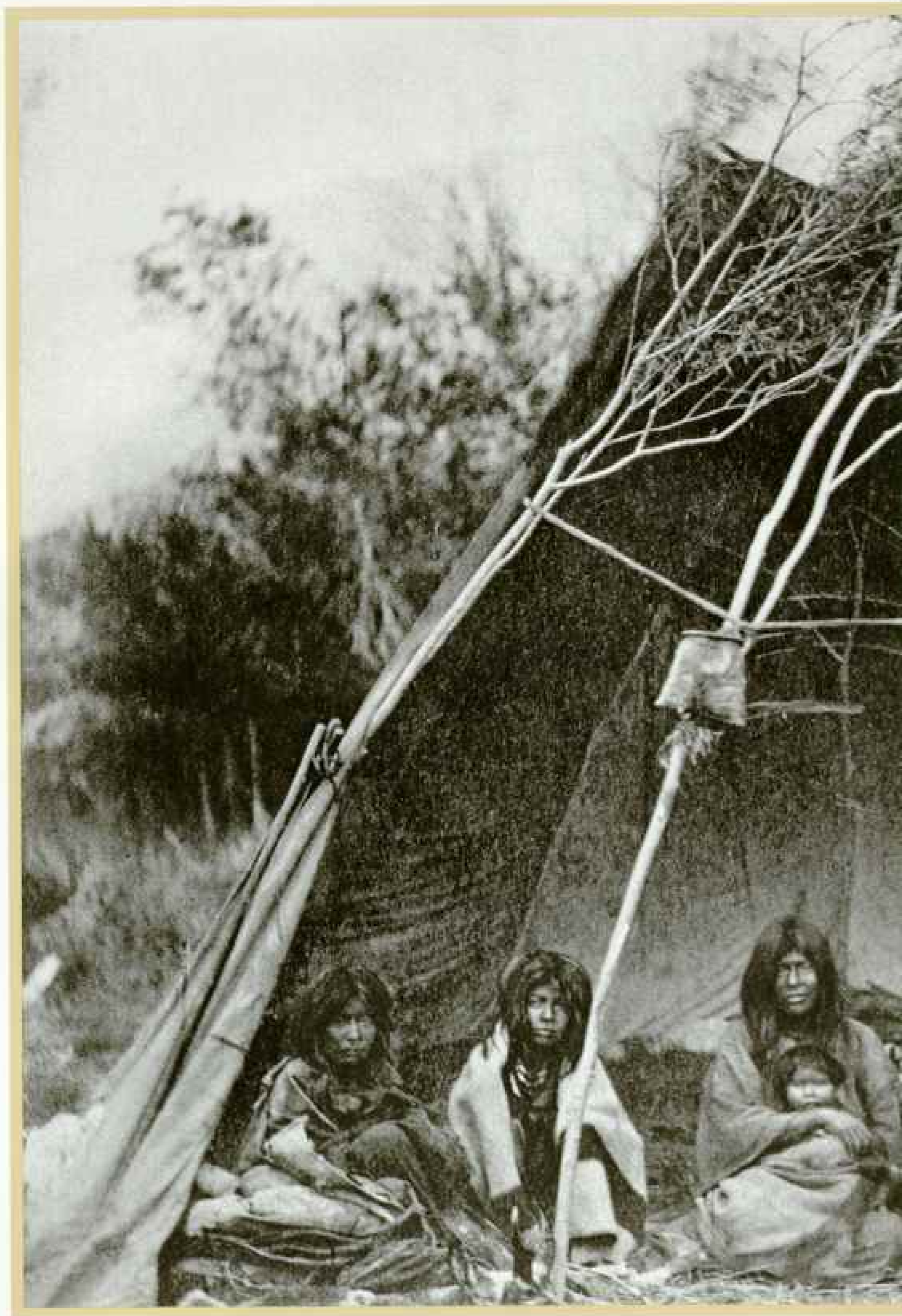
ASSISTANT EDITOR

Illustrations by **JAMES L. AMOS**

NATIONAL GEOGRAPHIC PHOTOGRAPHER





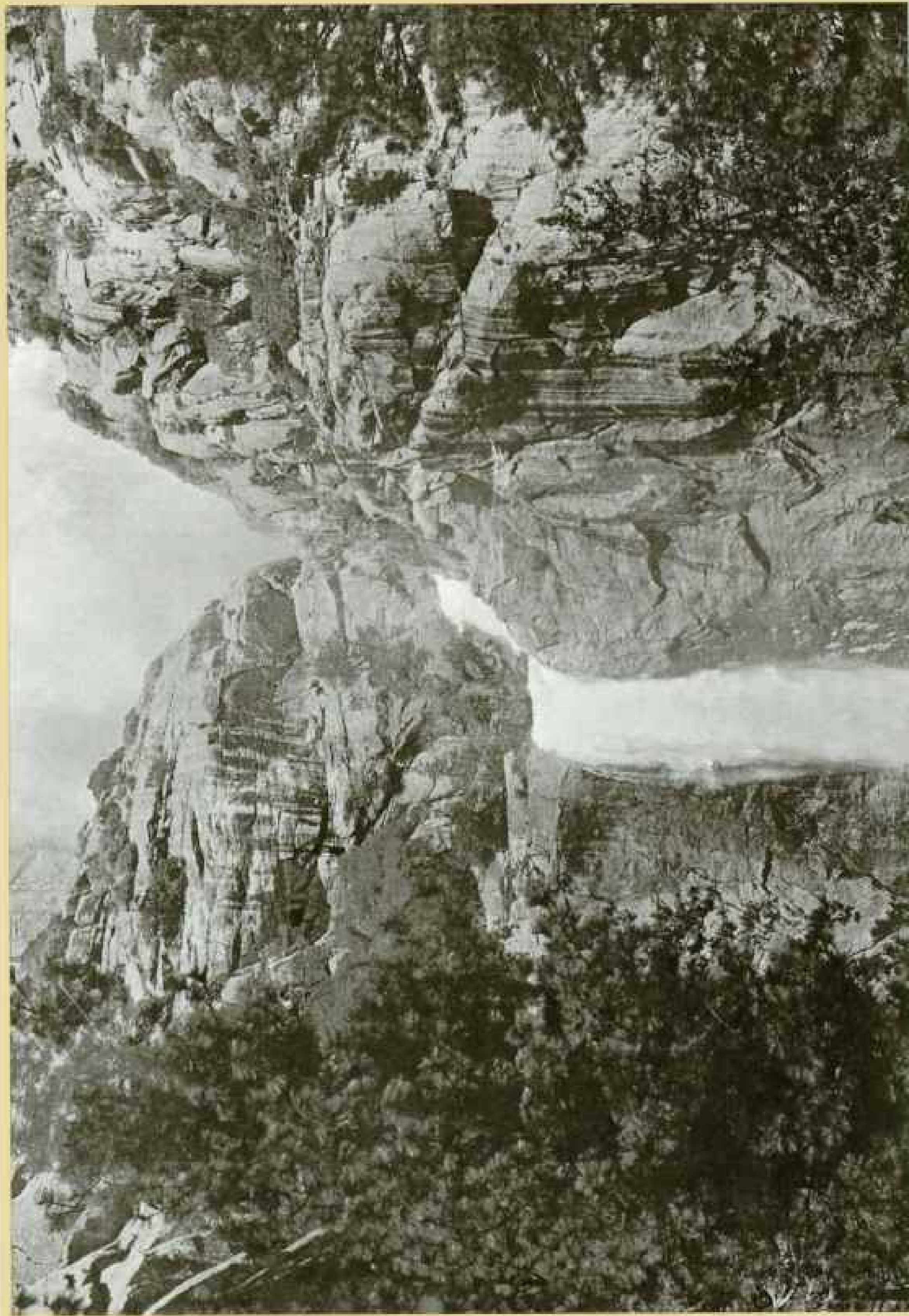


STILL SECURE in their ancient ways, Shoshone-Bannock pose for Jackson in their family tepee in Idaho in 1871. His extensive photographs of Indians, ranging from



AMERICAN ANTIQUARIAN SOCIETY

tribal encampments to reservation house raisings, index their transition from free-ranging peoples to wards of the United States.



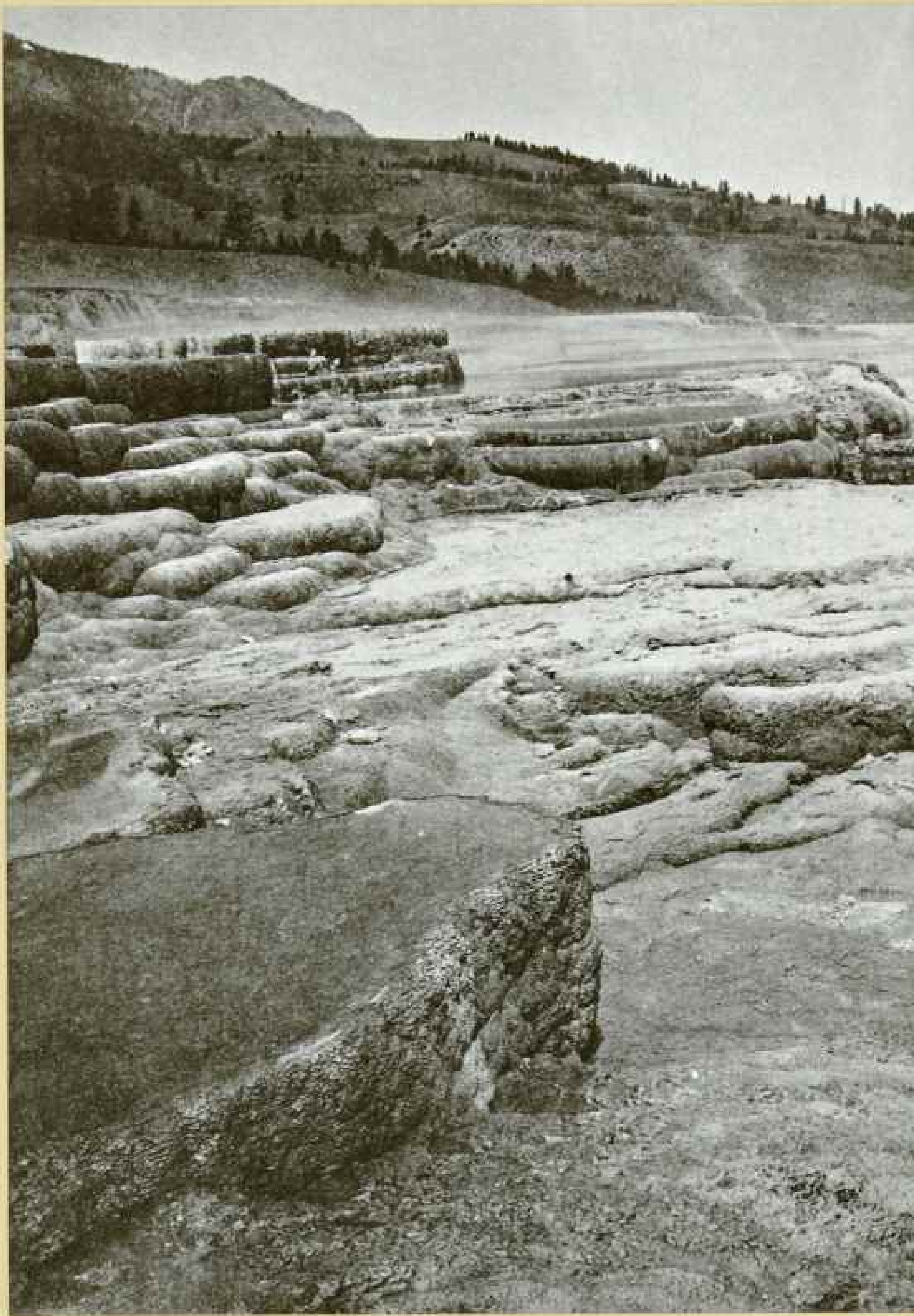


06216-LOWER YOSEMITE FALLS.

W. H. JACKSON

CALIFORNIA HISTORICAL SOCIETY

Getting a perspective on nature's grandeur—including a person for scale—became a Jackson specialty as shown in this 1880s view of Lower Yosemite Falls.





AMERICAN HERITAGE CENTER, UNIVERSITY OF WYOMING

picture. Abundant hot water hastened on-the-spot developing. Jackson photos and Moran color sketches of Yellowstone's geysers, caldrons, and awesome gorge influenced Congress to make the area the world's first national park in 1872.

CHALLENGE was a constant in the typical working day of pioneer photographer William Henry Jackson. He liked it that way—the cumbersome wooden cameras and glass plates a challenge to pack across a wilderness, the temperamental wet-plate process a challenge that was never reduced to mere formula, the uncharted mountains, canyons, and rivers that challenged endurance and reduction to known places on a map.

For most of the 1870s Jackson's cameras served the Hayden Survey, an official agency commissioned to remove the uncharted label from some of the West's most glorious scenery—the Teton and Wind River Ranges, the San Juans, Colorado's central Rockies. His photographs of Yellowstone, the first widely published, made his name known and erased decades of disbelief, prompting Congress to create the world's first national wilderness park. Jackson's longevity—nearly a century—gave him time to fight a Civil War, court three women and wed two, leave us some 30,000 scenes of our world from Latin America to Siberia, and capture the frontier on his artist's easel. He had a nose for opportunity, a zest for tomorrow's tasks that drove him on.

All of that I understood about this trim, blue-eyed, multitalented man who was also writer, bullwhacker, wrangler, lecturer, winner of countless photographic prizes, and sometime player of the flageolet. What I didn't understand, with a bias fed by fatigue, was his fondness for oxygen-poor high places.

That question stood uppermost in my mind on a Colorado day when the visible world was a few finite yards of dripping spruce, dark lichened rock, and ever upward trail. The slick underfooting soon had me puffing like a steam engine. How much farther could it be to Half Moon Pass, I wondered, and would Mike Foster be waiting there as planned?

I was on one of Jackson's multitudinous Western trails. With luck I'd emerge above this atmospheric soup before reaching the 11,600-foot pass and a high vantage beyond on

SEEKING high places for his panoramas, Jackson, kneeling, set up this 1872 shot in the Teton Range to show how it was done in the field—darkroom tent ready for developing glass wet plates on site, a complex process. Much of the West first became known through the eye of his cameras.

NATIONAL PARK SERVICE





Four seasons of life



Look of youth survived Civil War service (above); mustache and dapper air marked Hayden Survey days.



Distinguished maturity came with later years in Detroit; new-fangled Kodachrome caught active 90s.



COURTESY FRANCES BELLEOD (TOP TWO); NATIONAL PARK SERVICE (CENTER); MRS. SIEGERS, COURTESY CARL BLAIR ROCK (BOTTOM)

Notch Mountain. From there I could view the Mount of the Holy Cross, with its namesake configuration of snow, on the anniversary date of Jackson's first glimpse of it 115 years ago—August 23, 1873.

The Mount of the Holy Cross is now just one of Colorado's 54 peaks over 14,000 feet, but in Jackson's day it was a tale old trappers told. For years there had been stories of an elusive mountain with a vertical slash on its face that held a 1,500-foot upright of snow, with a proportionate snowy crossarm. You could see it from Grays Peak, but upon approach it always vanished into a skyline maze, as into a warp of misty time. Its evanescence raised questions in Jackson's mind as he and two assistants backpacked 120 pounds of photo gear upward on that murky long-ago morning.

The question in my mind had to do with my endurance, softened as it was by threescore years in an oxygen-rich sea-level environment. The weather was a question both to Jackson's party and to ours: Would the cloud curtain part and reveal the scenic prize?

Dr. Mike Foster, historian and a leader in the Colorado Mountain Club, resolved his impatience over my deliberate pace by hurrying ahead to locate a plaque marking the site of Jackson's 1873 photographs.

The story of the Holy Grail had come to Jackson's mind as he struggled upward through clouds: "No man we talked with had ever seen the Mountain of the Holy Cross. But everyone knew that somewhere in the far reaches of the western highlands such a wonder might exist." Distant sightings had led

HAUNTED by his lost love, Will kept memories of Caroline (Caddie) Eastman fresh with this ambrotype (right), found among his things at death. A belle of Rutland, Vermont, she rejected him after a quarrel in 1866, some say because he recklessly overturned a buggy. The emotional upset sent Will to the West and fame as a pioneer photographer, but with his artist's pencil he limned the life that might have been. The cameo portrait vanished for years, then turned up at Brigham Young University Library, thanks to persistent research by photographer Jim Amos. Hidden inside were lines penned at the betrothal of a union that would never be: "Now all young men take pattern by this / And soon obtain its same sweet bliss / For Caddie's now a blooming bride / With Willie standing by her side."

BACKGROUND SKETCH COURTESY NATIONAL PARK SERVICE



Caddie.



him to this mist-laved ridge where he "emerged above the timberline and the clouds, and suddenly, as I clambered over a vast mass of jagged rocks, I discovered the great shining cross dead before me, tilted against the [opposite] mountainside."

But before his teammates could arrive with his photographic kit, the cloud curtain fell for the day, and the crew descended to a foodless, blanketless night around a campfire below timberline to wait out the weather. When the next dawn broke clear, Jackson re climbed the ridge, set up, and made eight exposures during the ideal brief moments when illuminating sunlight interplayed with depth-defining shadow—another instance of Jackson's life-long luck of timing.

My timing was not that lucky. The enveloping clouds delayed Mike's site quest and our rendezvous until midafternoon when the mists swirled apart long enough to give us a tantalizing partial view of the elusive cross. But the slanting light failed, and next day's forecast promised more wet gloom, and so with that glimpse we had to be content. But I had gotten another meaningful measure of Will Jackson's indefatigable photographic enterprise.

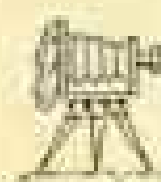
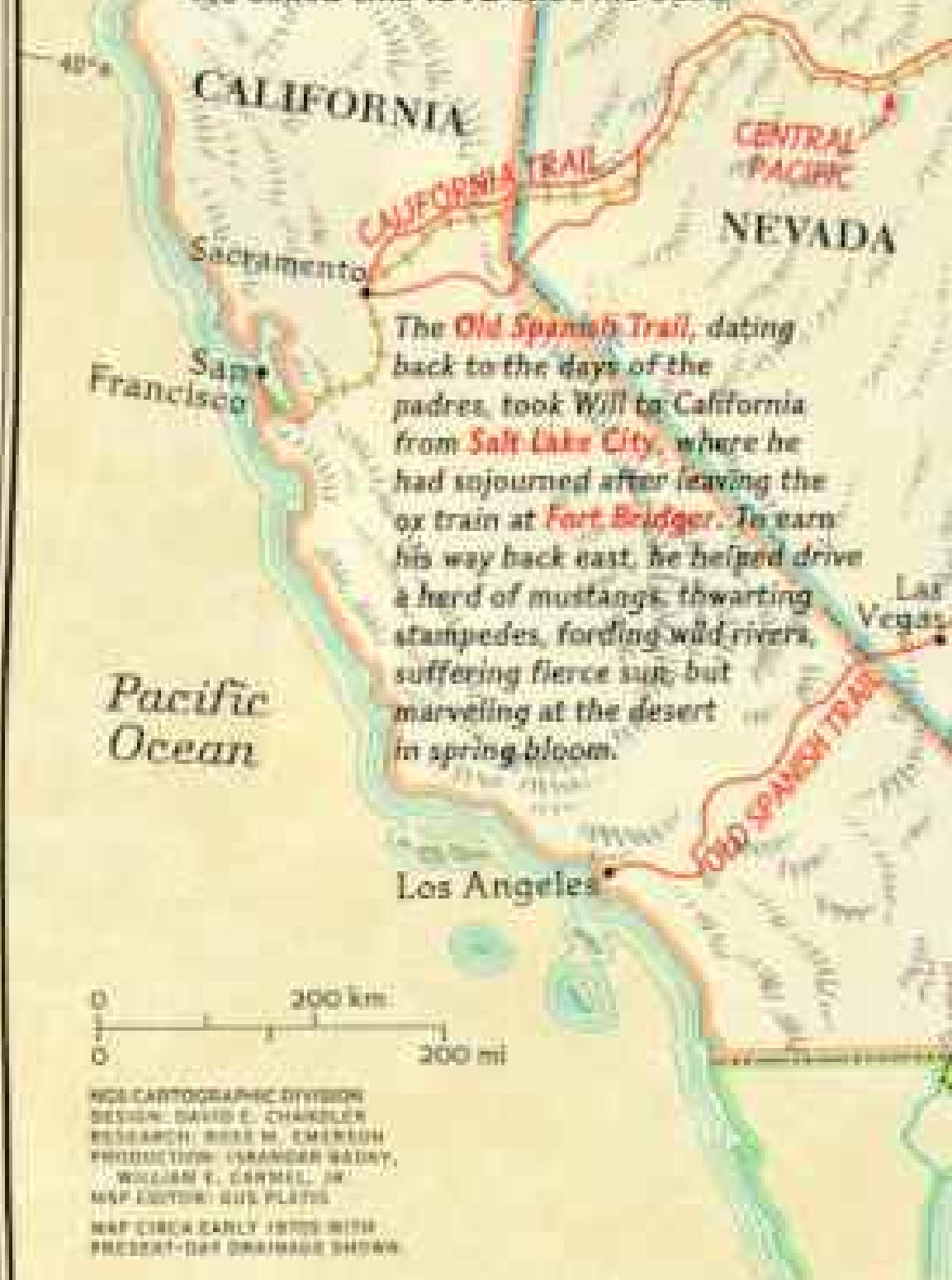
JACKSON WORKED in an era when photography was still a primitive and uncertain science, but its images carried conviction. Yellowstone, the Mount of the Holy Cross, and Anasazi ghost cities were stellar entries in his vast catalog of photographic firsts—including vanishing Indian tribes and their ways, raw-lumber mining towns with no more permanence than a line squall, and everywhere the railroads that were changing everything. In Wyoming he recorded spike-driving crews laying America's first ocean-to-ocean railroad; in tsarist Russia he photographed convict laborers laying the first rails across Siberia.

His 99 years gave him a recall that spanned an uncle's homecoming from musket warfare with Mexico and Japan's aerial attack on Pearl Harbor, that knew oil-wick lamps and electrical incandescence, jolting stagecoaches and airline in-flight dining.

And his 1843-1942 life span approximated the first century of photography—that beach-head science that visually records the world around us. His birth came only four years after people first marveled at fragile daguerreotypes; he learned photography largely as a



Yellowstone's dependable Old Faithful geyser challenged Jackson's cameras. He called this 1872 shot his best.



HE FIRST SAW the high plains and sky-held peaks as a 23-year-old bullwhacker on the Oregon Trail; he last saw that far country on a summer sortie in his 99th year. In between, the American West, stretching from the Missouri to the Pacific, became the special province of Will Jackson.

Initially his consolation prize for losing Caddie, the frontier lured him to a new life and called him back again and again.

The West of William Henry Jackson

"New wonderland" called **Yellowstone** stirred "tremendous enthusiasm" in Will, who photographed it for the Hayden Survey in 1871, '72, and '78. The survey also assessed its thermal spectacles and inventoried its flora and fauna, transforming it from far-fetched story to natural preserve.

The **Union Pacific** and **Central Pacific**, in a track-laying race to complete the first transcontinental railroad, made headlines after the Civil War. In 1869 Will, now with his own studio in **Omaha**, could ignore it no longer: "I was eager to be on the road again and with my camera make a record of what was happening."

The **Oregon-California Trail**—the road west for a third of a million pioneers—was Will's road to a new life. He painfully learned to crack a bullwhacker's whip over a 12-ox team hauling supplies to gold miners in **Virginia City**, Montana.

Boots and bandanna completed Will's outfit for taking to the trail in Hayden Survey days.

Mesa Verde area cliff dwellings became real to the public with the printing of Jackson's 1874 photographs. He visited many living pueblos and ancient ruins over the years, including **Hovenweep**, which he named, adapting an Indian phrase meaning "deserted valley."

While learning hard lessons as a green-horn ox-team driver in 1866, he first heard from old mountain men of the legendary Yellowstone country, instilling from that moment "a longing to go there." Though later travels showed him much of the world, nothing matched the "delightful memories" of those earlier years in the West. With his cameras, paint box, and diaries, he left us a valued record of his delight.

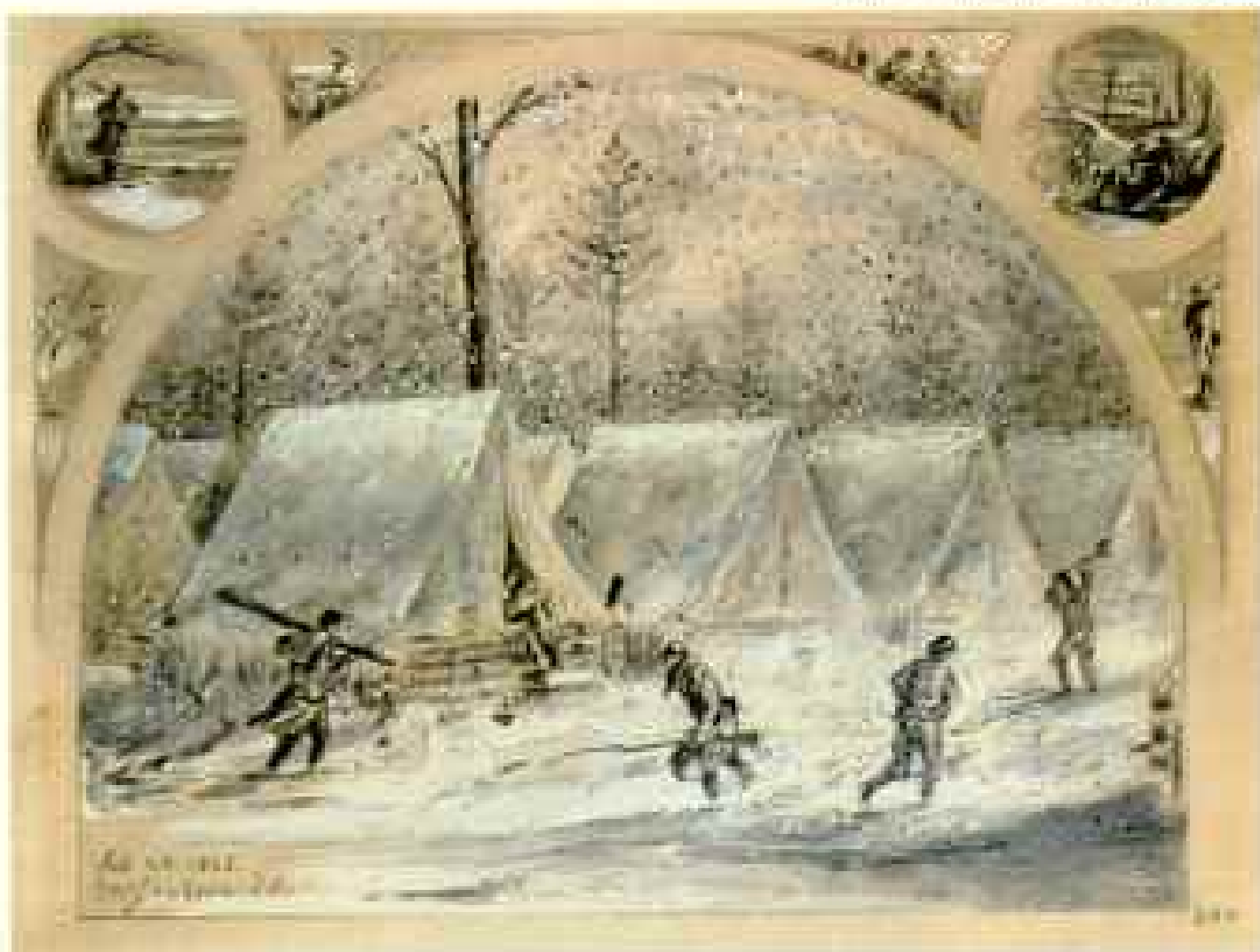


GETTY IMAGES/HERB RITTS

AN ARTIST first and last, Will sketched Civil War comrades making tents snug against the snow. His talent won him the assignment of depicting Army life, a task he embarked upon with, he admits, "a little swagger." As a bullwhacker he painted frontier scenes, including a wagon train beset by storm and lightning, a bolt striking the first transcontinental telegraph line.



BOTH FROM NATIONAL PARK SERVICE



DIARIST EXTRAORDINARY, Jackson left journals covering almost a third of his long life, a library in itself (facing page). Soldier and lady adorn his Civil War diary, and the opened journal at center details his resolve in his 80s to organize his days so he could accomplish more. The trove is in the New York Public Library's manuscripts section.

teenage retoucher looking over the shoulder of early portraitists; he took his historic Western pictures mostly with the fickle collodion wet-plate process; he lived to see the age of reliable color film, the ubiquitous Kodak, the 35-mm Leica. "If I'd had one of these on the Hayden Survey," he is said to have remarked in 1939, "I'd have made many more pictures and lived longer." Reaction to his first sight of an automobile: "What a fine way to get around with a camera!"

In his 90s he became a delightful anachronism, amazing the world with a hand still steady enough to turn out scores of historical paintings, legs sturdy enough for Colorado's 12,000-foot passes, a mind able to construe a 341-page autobiography called *Time Exposure*. As his birthdays mounted toward the century mark, each became a festive salute, often celebrated at the New York Explorers Club, of which he was a life member, and with congratulatory cards and telegrams from across the country. When he died, on June 30, 1942, he was laid to rest to a litany of honors in Arlington National Cemetery, and a World War II Liberty ship soon carried his name; yet in our own time Americans have largely forgotten who he was.

FROM HIS early years Jackson had a very clear notion of who he was. The first of seven children born to George Hallock Jackson and Harriet Maria Allen in Keeseville, New York, he grew up with a sense of place

and family derived from Quaker forebears. His were uncelebrated folk, except for one relative who gave Will the claim to being a real live nephew of his Uncle Sam.

Uncle Sam Wilson, actually Will's great-granduncle, was a supplier of meat for the Army in the War of 1812. His casks of beef and pork were stamped "U. S.," and when people



WORLD-CLASS ICE PALACE, 450 feet long with 90-foot towers, rose over Leadville, Colorado, in 1895-96. A civic promotion after the panic of '93, the project was thwarted by a mild winter and early thaw.



asked what the initials stood for, the facetious reply, according to Jackson, might be: "What! Don't you know Uncle Sam Wilson? Uncle Sam's a great patriot, and he's feeding up the army to lick the British." The story grew, and ultimately inspired cartoonists like Thomas Nast to evolve the lanky, chin-whiskered gent in plug hat and swallow-tailed coat. A monument over Uncle Sam's grave in Troy, New York, celebrates his unique place in history.

Jackson's place in history was presaged early. His father, a blacksmith and carriage maker, was fascinated for a time with daguerreotypy, and old camera parts became playthings for Will, who innocently "got the feel of a camera almost before I could walk." And his mother discerned in her firstborn some of her own artistic talent and put pencils and brushes in his hands: "I can hardly remember the time when I didn't draw pictures."

Jackson's father had a restless spirit that took the family to Georgia, Virginia, and Philadelphia before settling near Troy. There teenage Will put his artistic talent to work painting scenic designs on window screens,

a fad of the times; soon he was hired as a retoucher by Schoonmaker's studio, giving him his first instructive insights into the new mystique of photography.

A better job at Mowrey's studio in Rutland, Vermont, diverted Jackson from the firing on Fort Sumter and the Civil War. But by August 1862 young Will was ready to enlist. "God knows that the country needs men," he wrote in the first of many diaries. He was mustered into Company K, 12th Vermont Volunteers. By November he was on picket duty "very near the rebel lines" south of Alexandria, Virginia; he would spend a winter, spring, and half a summer doing the Army shuffle, gradually moving west to Centreville and beyond, with cannonading now to the right, troops engaged to the left, but Company K peculiarly immune—that Jackson luck. He and his buddies foraged for persimmons, cabbage, sweet potatoes to add savor to Army pork and crackers. In tedious practice to speed musket loading, he could laugh at himself: "Blank cartridge drill today; fired away my ramrod."

His kit for soldiering included india ink

GARDEN OF THE GODS at Colorado Springs was a frequent backdrop—here for a ticket agents' gathering. From his Denver studio Jackson shot any marketable scenic view and sought profitable railroad assignments.



COLORADO HISTORICAL SOCIETY (ABOVE AND OPPOSITE)

and sketching paper, with which he soon was turning out pictures of camp that impressed his company commander, who gave him a new job—to depict Army life. He rummaged wartime Washington for art supplies, ranged picket lines and company streets with brushes and portfolio, was briefly detained as a suspected spy while sketching rifle pits.

Late June 1863 found the Union's Virginia troops being yanked out of the line and headed north, by regiments and brigades, in response to Lee's thrust into Pennsylvania. On sore, weary feet the 12th Vermont pressed past Frederick City, Maryland, and Catoctin Furnace, through drenchings that flooded roads ankle-deep, to pause and load guns July 1 "within three or four miles of Gettysburg."

But again that Jackson luck: While the First Vermont marched on into battle, Will's 12th was detailed to fall back and guard baggage trains. On the climactic third of July, noted Jackson, "We rested all day," and on the fourth they unloaded and cleaned guns, endured another thunderstorm, and took charge of 2,300 Rebel prisoners for escort to prison

in Baltimore, where the 12th's nine-month enlistment ran out. His country honorably served, Jackson heard no inner call to reenlist; he went home to a valedictory review in Brattleboro before the governor.

In Vermont his life settled into an idyllic track: employment at Styles' Vermont Gallery of Art in Burlington as a photographic retoucher at a princely \$25 a week! He learned a taste for brocaded waistcoats and beaver hats, for camaraderie with young male peers who secretly named themselves the Social Sardines, with young females who joined in amateur theatricals, literary readings, and Sunday excursions. Best of all, he had a fiancée in Rutland, "pretty and vivacious" Caroline (Caddie) Eastman, "the belle of the town." Souvenir sketches by Jackson depict the carriage rides, steamer cruises, lakeside picnics that figured in his present, the growing old gracefully in bucolic New England that he visualized for his and Caddie's future.

But such was never to be. In April 1866 there was a lovers' quarrel: "She had spirit, I was bull-headed, and the quarrel grew."

Dismissed from her favor, he left Vermont without good-byes to anyone, alone on a night train, his life a shambles—something to run away from. But it was this fierce hurt that sent him west to a life of high adventure and lasting accomplishment. That Jackson luck again.

Except for his weight of sadness, Jackson traveled light: "Picked out a couple of shirts, a pair of socks & a hdkf; put on my best coat and heaviest boots. Kept just one photo of C., an enlarged copy, which I carefully treasured next to my heart—for a while." (Later he lined out the last-mentioned confidence in his diary, but a picture of Caddie would be found with his effects when he died 76 years later—to

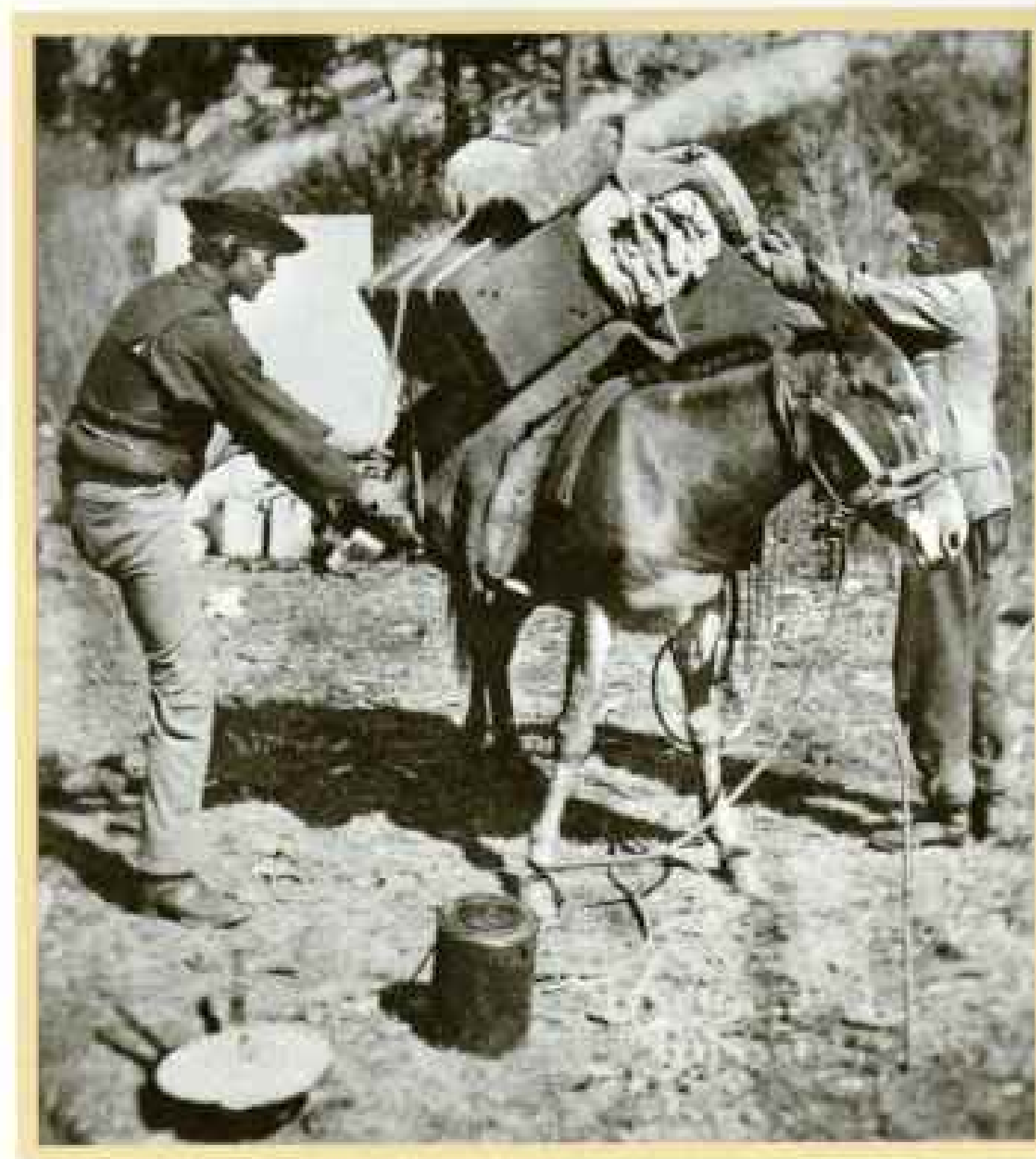
the astonishment of his family and friends.)

In New York City, his thoughts already on the West, Will found ready partners in an old Company K friend named Ruel (Rock) Rounds and a friend of Rock's, Billy Crowl. But they could afford second-class tickets only as far as Detroit, where Will learned what it means to go broke; he was charitably allowed to sleep in a police station. As he curled up in a blanket on a broad windowsill, he considered his change of circumstances: "What would acquaintances say? The position struck me as being decidedly ludicrous and I had quite a little laugh all to myself over it."

Finally reaching Chicago, Jackson found work as a sign painter, then as an art instructor, earning enough to help the trio by late June 1866 reach St. Joseph, Missouri, where rail lines ended and Western trails began. Answering a "Teamsters for the Plains" ad got them jobs driving a freighter's ox teams hauling food, sundries, and whiskey to Montana goldfields, just the place for down-on-their-luck lads to pick up a fortune and go home in glory.

THE WAGON TRAIN would assemble at Nebraska City, a three-day upriver run for the side-wheeler *Denver*, which was entertainingly crowded with fellow adventurers and Mormon families.

The first day's hitching up of the 12-ox teams became agony for Jackson. He was handed a heavy wooden yoke and pointed toward his "wheelers." "Now I had never yoked a steer in my life & was not certain whether 'gee' meant turn to right or left." He watched an experienced hand and imitated, going for his "leaders," "pointers," and other pairs, while 24 other drivers tried the same thing with some 300 animals, many of them "half wild Texan steers." It was noon that first day before the train could roll, and Will found he had nerve endings he had never suspected and a talent



MUSEUM OF NEW MEXICO

SUREFOOTED MULE Old Mag braces against the cinching of a top-heavy load of photo gear, which sometimes included the 20-by-24-inch camera that Jackson was first to use in the Rockies. Top-heavy Mag was once saved from tobogganing down a mountain by lodging against trees; another time she fell off a cliff and landed on her back in a scrub cedar, which sprang her out on her feet on the switchback below. Hauling heavy gear to high places made it "strenuous work . . . to keep everything right side up."

Photographing in the Frontier Mode



USING 19TH-CENTURY techniques, photographic historian Doug Munson duplicates the wet-plate process Jackson knew. In a dark tent Doug coats glass with viscous collodion prior to dipping it in silver nitrate to make it light sensitive. He rushes the plate to his camera, previously focused on Yellowstone's Lower Falls, and makes an exposure. Then he hurries back to his tent to develop the glass-plate negative (right) before it dries and loses sensitivity. Like Jackson, Doug got mixed results, from failures to fine images. Like Jackson, he responded to challenge and built success on field experience.



for cursing his "bull-headed" charges that shocked him: "As long as I drive oxen I do not see how I can avoid it entirely. It comes of itself & I cannot keep it back."

Despite long treks and dust that cracked lips until they bled, he found time to fill his pad with sketches of a bearded wagon master, of a fellow bullwhacker cracking his 18-foot whip over his plodding team, of the evening circle of wagons beneath wide skies: "Away out upon these open boundless plains, one has a sense of almost perfect freedom."

By the time he reached western Nebraska, Will was a seasoned bullwhacker, leading his train through Mitchell Pass to a camp beneath towering Scotts Bluff. The campsite was relocated by Jackson himself in 1938 at age 95. Merrill Mattes, a leading Oregon Trail historian who was then superintending the Scotts Bluff monument, told me about it: "Jackson came through on his annual Western trip as research secretary of the Oregon Trail Memorial Association. He talked about leading his train through the pass in 1866. I asked him to show me where he camped, and we hiked over there, and he hopped around from one little hummock to the next, finally saying, 'Right here.' So I took a picture of him driving a stake to mark it. Now there's a plaque there."

In Wyoming, Indians preoccupied the bullwhackers. It was a violent decade, leading to campaigns that would crush the Plains tribes forever. The Army in 1866 required that wagons go in trains of 300 for protection. There were swift attacks here and there.

On August 17 Jackson's train rumbled past Deer Creek Station and camped beyond: "On the morning of the eighteenth, just as we were rolling out, flames suddenly shot up behind us. A few minutes later the telegraph operators and a mail rider galloped by shouting 'Indians!' — a band of braves had swooped down on the station at daybreak and set the place on fire. At least three men were killed and scalped. The survivors were on their way to sound the alarm at the military post which lay just ahead. For the first time since leaving Nebraska City all our Spencer carbines were brought out, ready for action. But we saw no redskins." It was that Jackson luck again: "According to rumor the Indians are raising the very deuce all about us & I think rather singular we don't see something of them. We hear of Forts taken & stations burnt, but they don't happen to come our way."

That luck held throughout Will's Western travels. Near Fort Bridger he elected to leave the Montana-bound train and visit the City of Saints by the Great Salt Lake, where he joined a train bound over the Old Spanish Trail to Los Angeles. To earn his way back east, he signed on to help herd 200 half-wild mustangs to a railhead in Julesburg, Colorado, thence to Omaha. Horses were wealth to the Indians, and stealing them was a mark of bravery, yet they did not bother Jackson's party, who got the horses through with minimal losses.

FROM OMAHA Will might logically have returned to his native East and picked up the threads of his life there; he had put enough time between himself and his great loss to face the past. Yet he had no sooner arrived in Omaha than a job offer waylaid him. A photographer hired him as a colorist and retoucher, then came a chance to buy out the studio. Jackson's brother Ed arrived to run the firm, and Will felt free to yield to his chronic wanderlust.

There were three-day trips to photograph the Osage on the great rolling hills south of Omaha, four days to record the Pawnee to the west. He fitted a buggy chassis with a darkroom for fieldwork. His pictures found markets locally and through dealers in the East.

Such outings merely whetted Will's hunger for new places. That yearning fixed on the ever lengthening Union Pacific Railroad as track-laying gangs drove west in a race with Central Pacific crews working east: "It is almost impossible to exaggerate the contemporary influence of the first transcontinental railway." "Here was something truly earth-shaking; and, whether or not there had been a dime in it for me, sooner or later I would have been out on the grade with my cameras." By June 1869 he and assistant A. C. Hull were ready to leave Omaha by rail with cameras and portable darkroom box, on a trip that would produce an order for 10,000 stereoscopic prints.

But for a romantic hitch they might have left sooner—in time to photograph the historic wedding of the rails at Promontory, Utah, on May 10 of that year. "My bride had chosen that date for her wedding day." The romance had developed swiftly after Mollie Greer of Warren, Ohio, had visited relatives in Omaha. An idyllic honeymoon cruise to St. Louis left Jackson with an obvious bias: "There is nothing like a Missouri River steamer!"

His first westward stopover from Omaha was Cheyenne, an untidy town that didn't exist when he returned from California just two years earlier. Travelers found it well provided with enterprising houses that offered liquor, gambling, and women under one roof.

For elegance the top establishment was Madam Cleveland's. Will heard that her ladies were "pretty solvent" and might like some photographs: "Hull and I thought we would go around and see if we couldn't get a job out of them. Talked it up a while but they seemed indifferent. I called for a bottle of wine, and soon after they began to take considerable interest in having a picture taken. Had another bottle, and then they were hot and heavy for some large pictures to frame and began

the encounter must have gone well, for the next summer Hayden was in Omaha, admiring Jackson's Indian and landscape photographs and remarking, "This is what I need."

In his fourth year of leading official surveys in the West, Hayden depended on an annual appropriation from Congress, in competition with other surveys. In Jackson's photographs he saw a way to win support. He offered to take Jackson along that summer as official photographer—no salary, just expenses. Jackson waited only long enough for wife Mollie's smiling assent before accepting. Thus his life took the final turn on a course that over the next decade would place him and his camera in many lofty vantage points on the leading edge of discovery and exploration.



PHOTOGRAPHED AT DENVER PUBLIC LIBRARY

to count up how many they should want."

Presumably to deliver finished prints, Jackson called at Madam Cleveland's two evenings later and "was much surprised to see Dr. Hayden come in with some military friends." "Hayden" was Dr. Ferdinand V. Hayden, a physician by training but an able field scientist by inclination and experience, and officially a geologist of the United States. Will noted that "he acted like a cat in a strange garret." But

THE REWARD of packing large cameras was a larger, more dramatic picture—the best way to get one before the days of enlargers. This 20-by-24 glass negative of Lake San Cristobal in Colorado's San Juan Mountains may have been the first he ever made in the field. Jackson believed the bigger camera was "worth all the extra labor it cost." The lake was created some 700 years ago by the massive Slumgullion slide.

A good mixer with an easy smile, Jackson fitted in comfortably with Dr. Hayden's ever-changing field parties of scientists, wranglers, and cooks. There were regulars like executive manager James Stevenson, whose expertise with logistics and people kept the survey on track. There was "Potato John" Raymond, named for his frustrations in trying to boil potatoes to palatability at 12,000 feet. There was astronomer and mapmaker Henry Gannett, who later would become chief topographer of the U. S. Geological Survey and a founder and President of the National Geographic Society. There was multitalented William Henry Holmes, geologist, artist, and anthropologist, who shared a coincidence of name, interests, and lifelong friendship with Jackson.

There were also one-season members like noted landscapist Thomas Moran, another lifelong friend, and C. Hart Merriam, only 16 in 1872 but already a keen ornithologist. He would become first chief of the U. S. Biological Survey and a trustee and vice president of the National Geographic Society. Many of the survey's alumni went on to high attainment.

The survey work was not all transits and plant presses; some days it was all slogging and slipping over steep trails in dreary weather just to get to a place to do some work. There was the day in camp that they got up a mule race, and Will's white mule Dolly lost, so he stood drinks all round from a nearby brewery and tavern, civilization's only amenity in that part of Colorado. There was the summer when James T. Gardner's field team got pinned down by sniping Indians and narrowly escaped up a cliff, while Jackson's party innocently traveled in safety a score of miles away—that Jackson luck again.

BUT WITH THE WOMEN in his life—those he truly cared for—his luck too often failed. In February 1872 his wife, Mollie, died giving birth to a daughter who lived but briefly. Years later he would refer to these events as still too painful to write about. From the field in '73 he was writing earnest letters to Emilie Painter, daughter of a Baltimore physician and from a Quaker family like his own. In October 1873 they were quietly married at her brother's home in Cincinnati, the start of a 45-year union that brought a son and two daughters. But his memory now held two faces dear to him whom fate had taken away.

There had been consolation during the summer of '73 in getting those first photographs of the Mount of the Holy Cross. At first it looked like bad luck: A pack mule named Gimlet had "slipped his pack," dropping and breaking Will's exposed plates, much of his summer's work. But Will doubled back on his trail, re-shot his pictures, often with improved results, and arrived at cloud-plagued Holy Cross at just the right moment, "when every condition was close to perfection." His photos caught the public fancy, appearing on many a parlor wall like icons of faith, inspiring Longfellow to reminisce on the wife he had lost: "There is a mountain in the distant West / That, sun-defying, in its deep ravines / Displays a cross of snow upon its side. / Such is the cross I bear upon my breast / These eighteen years, through all the changing scenes / And seasons, changeless since the day she died."

Jackson found good medicine in his summer field trips with their unfolding of new horizons. Colorado's San Juans in 1874 lifted Will with "the grandeur of the mountains and of the cañons and the cascades, which seemed to drop from out of the sky. . . ."

Also absorbing were lingering snowfields across the trail, precipices perilous to man or mule (one mule did fall, miraculously landing upright and unharmed on a switchback below), sudden storms atop mountains, so electrically charged that, in the words of topographer Franklin Rhoda, "When we raised our hats our hair stood on end, the sharp points of the hundreds of stones about us emitted a continuous sound, while [our transit] out-sang everything else, and . . . could be heard distinctly at the distance of fifty yards."

Jackson's journals, while amply descriptive, seldom revealed deep feelings, but an exception was his climb to his first cliff house. It hung about 800 feet above him in Mancos Canyon, and the sighting as evening camp was made sent all hands clambering upward. They all tired and dropped out except for Jackson and Ernest Ingersoll, who found ancient toe- and handholds in the last 50 feet of wall as night came on. Attaining the terrace before the ancient door and windows, he looked down and "our campfire glimmered like a bright little star." "It was worth everything I possessed to stand there and to know that, with Ernest Ingersoll, I was surely the first white man who had ever looked down into the canyon from this dwelling in the cliff."



COLORADO HISTORICAL SOCIETY

MOUNT OF THE HOLY CROSS was a legend before Jackson in 1873 got the first views of it—perhaps his most famous pictures. A screen of clouds kept Will guessing until at last he topped a ridge and “stood face to face with the Holy Cross in all of its sublime impressiveness.” Members of Denver’s Jackson Color Camera Club display their versions. Mountaineer Carl Blauroch, center, remembers when Will was persuaded in 1940 to let the club honor him by using his name. He has one of Jackson’s Holy Cross plates, which Will confessed to touching up in “a spot or two.”



UNITED STATES GEOLOGICAL SURVEY PHOTO LIBRARY (BELOW), BRIGHAM YOUNG UNIVERSITY

SCOUTING out a new land, members of the Hayden Survey pause for a picture before their 1870 sweep across southern Wyoming. Dr. Ferdinand V. Hayden, physician turned field scientist, sits behind the table at center. Jackson, who set up the shot for an assistant, stands at right.

With annual appropriations from Congress, such surveys mapped and cataloged the West when it "was still largely uncharted territory from a scientific point of view." Veteran Hayden hands included "Potato John" Raymond (right), so named for his frustration in trying to boil potatoes at 12,000 feet. Here he flips a flapjack—with the help of Will's paintbrush, which froze in air what a long exposure could not.



THE COMPLEXITIES of photographing such scenes with the pioneer wet-plate process required speed, the luck of an alchemist, and the dexterity of an acrobat.

First, the weighty box of a camera must be set up and the subject framed and focused. Then the photographer must retire to his darkroom (in the field, a lined tent or portable hooded box) and prepare his glass plate: Clean it with cotton flannel and a brush, coat the front side with viscous collodion, then immerse it in silver nitrate to make it light sensitive. Wipe the back of the plate clean and insert the plate into a light-tight holder. Insert the plate into the camera, then expose it by removing the lens cover (say, for 30 seconds at *f*/32 in reasonably good midday light). Recover the exposed plate from the camera with the holder, hurry into the darkroom or tent, and immerse the plate in developer; if you have done each step absolutely right, you now are rewarded by an emerging image.

And if not, start all over again. In the sense that results were immediate—good or bad—it was a sort of primitive Polaroid. The entire procedure took about half an hour. Ten exposures was a good day's work, 15 outstanding.

To appreciate what Jackson did, photographer Jim Amos and I arranged a field trip with a modern-day wet-plate photographer. Doug Munson's Chicago Albumen Works in Housatonic, Massachusetts, has earned a national reputation for making prints from historic glass-plate negatives on historically authentic albumen (egg-white-coated) paper. In his photo labs he has mastered the demanding process that Jackson followed.

Our first choice for Doug's wet-plate recreations was 10,000-foot-high Seneca Lake in Wyoming's Wind River Range. In 1878, the Hayden Survey's last year, Jackson had exposed some crisp scenics across Seneca Lake and its small island toward crowning Fremont Peak. To get to the site, we enlisted the pack-train help of the nearby Box R Ranch, because the area lies within the Bridger Wilderness, reachable only on foot or horseback. The need to pack at least 150 pounds of cameras, tripods, glass plates, darkroom tent, and other necessities made horsepower the attractive option. On a mild September day we wound upward for five hours through conifers and amid far vistas to a campsite just below the lake, then climbed toward Jackson's probable

vantage point in the sun's late light. Twenty minutes of scurrying search ended with high excitement—we got an exact match of foreground details in one of Jackson's shots with what lay before our eyes. It was as if we could see the imprints of his tripod!

Next day, ice still rimmed meadow pools when Doug headed for the high ground where he would do his day's work, his weighty kit aboard a calico mule named Patches. He soon had the bright red darkroom tent up and arrayed with tank, trays, and suspended water bottle. His 11-by-14 fugitive-from-a-museum camera, festooned with its black viewing cloth, stood on a granite shelf, framing what Jackson had framed. Jim Amos and Colorado Historical Society photographer David Diaz Guerrero unlimbered state-of-the-art Nikons to document this exercise in obsolescence.

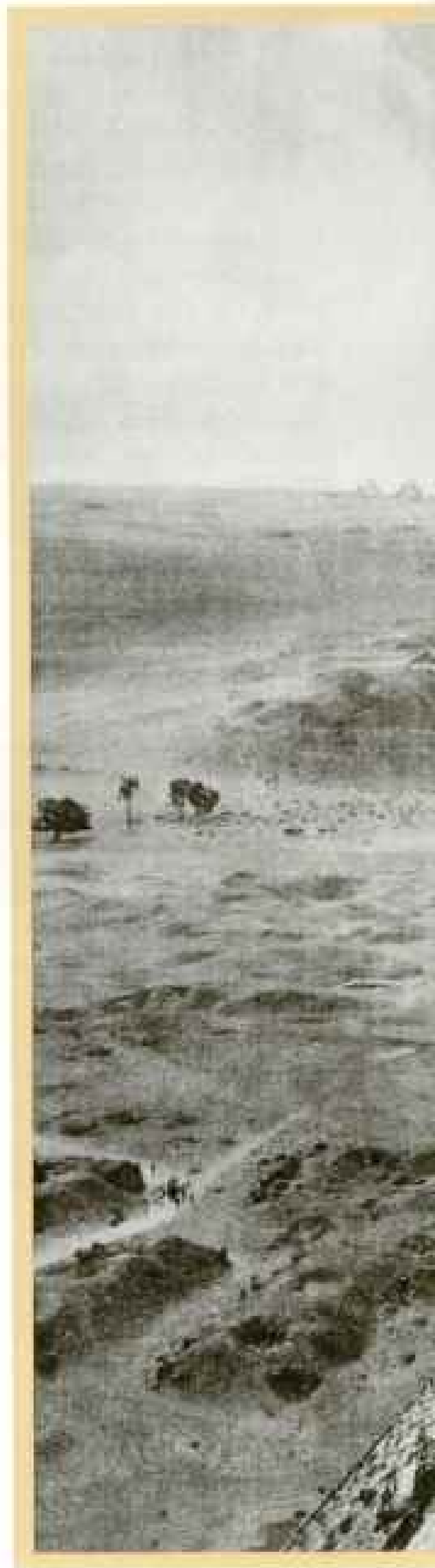
But through the day, things go mostly wrong. Fog and striations on the early plates, virtually no coherent images. Try a different batch of collodion (perhaps this one hasn't aged enough), use more restrainer in the developer, try less restrainer. Check water acidity—has acid rain affected the local water source? Noon comes and goes; Doug labors on, increasingly huffing the hundred or so uphill yards between darkroom tent and camera.

Finally, as I crouch in the tent's eerie red light and watch Doug's practiced swishing of exposure No. 9 in the developer, the silver-sunbeam magic of the old black-and-white process begins to work—the blank plate assumes a recognizable reality. But the quality is still short of Doug's standards. Only later will he find the answer: "When I got back to a motel in Jackson, Wyoming, I set up my developing kit in the total darkness of the bathroom—and the problem was solved!"

Though the tent fabric adequately filtered Massachusetts' near sea level atmosphere, it could not stop the additional radiation that penetrates Wyoming's high clear air. Doug went on to the Grand Canyon of the Yellowstone, another Jackson site, and at last got first-rate photos of the Lower Falls there.

Jackson had similar troubles, even in his last year with the survey, in that same Wind River country. From his August 1878 journal: "Head of Popoagie - Wind River Mts. under Wind River Peak. First plate exposed looked bad, wavy lines throughout film as tho' collo. was at fault. Image dev. rather thin & weak. . . . Took my traps to a point on the lower lake

ANCIENT SCENES and alien faces intrigued Jackson as he visited four continents in 1894-96 as photographer of the World's Transportation Commission. Jackson took the opportunity to widen his marketable scenes—Tunis, the ruins of Carthage, a dizzying look from Egypt's Great Pyramid (right); the paddies, tea plantations, and panoply of elephants of Ceylon and India; New Zealand's hot springs and Australian Aborigines (below); China, Japan, Siberia. He returned to find his Denver studio foundering and tried to recoup with a lecture tour (bottom) that didn't work. He solved his dilemma by swapping his huge store of photos for stock ownership and a job with Detroit Photographic Company, soon to become Detroit Publishing Company.



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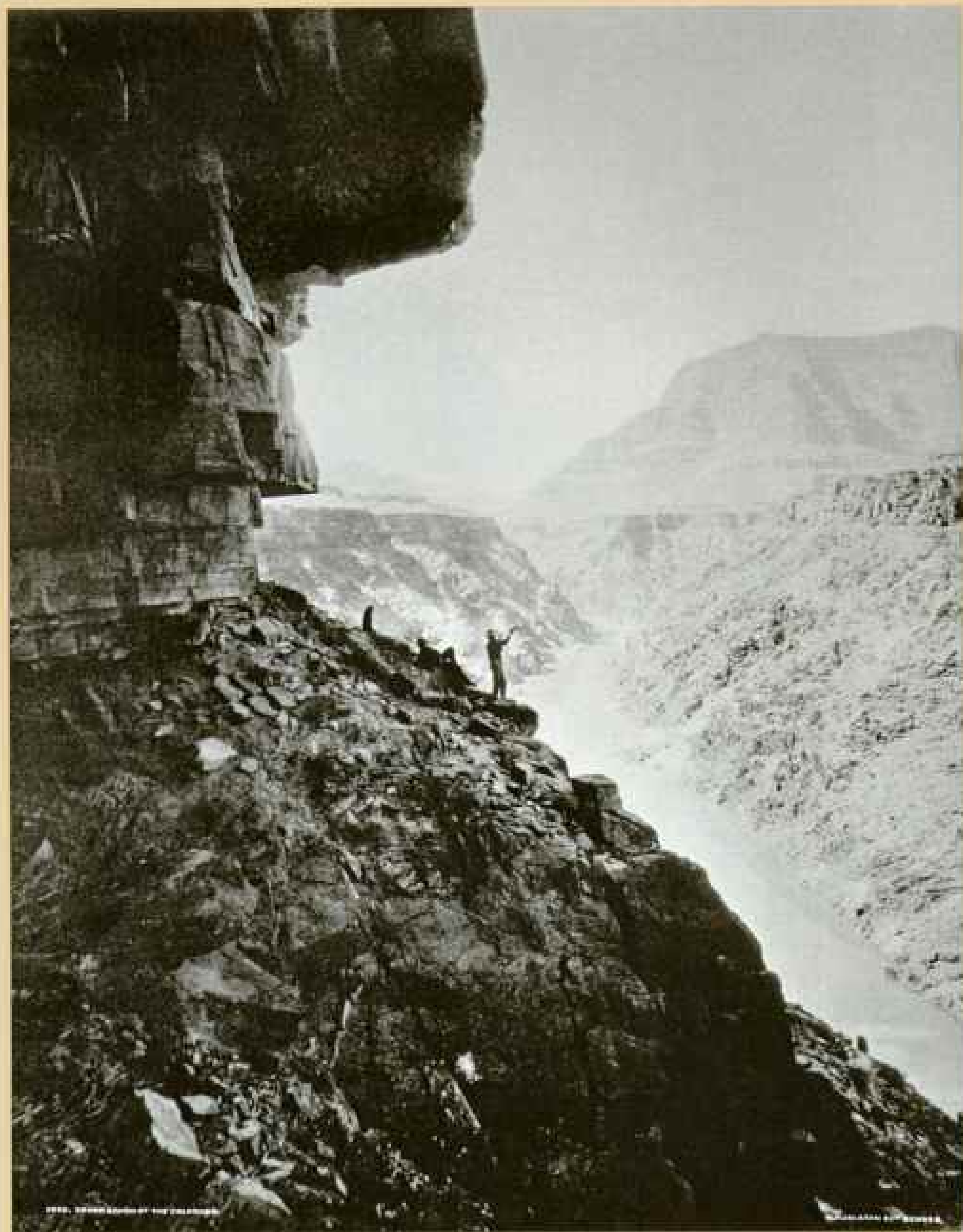




BRIGHAM YOUNG UNIVERSITY



CAMERA that framed the grand tour, a 6½-by-8½-inch Blair, survives in the museum at the headquarters of Yellowstone National Park. Given to Grand Teton National Park by Jackson grandson Donald McLeod of Detroit, it came to Yellowstone in a sorting out of Jackson photographs and Thomas Moran paintings. Searches have turned up no authentic cameras from Will's Hayden Survey days, when he was also experimenting with rubber-band-actuated shutters and a rotating 360-degree camera using paper-roll film that he coated himself. He got the latter idea at the Centennial Exposition in Philadelphia in 1876.



L. PAUL BETTY MUSEUM

ABYSSAL VASTNESS of the Grand Canyon comes through in an 1883 shot. Though he favored the Western U. S., Jackson photographed in many states, as well as Canada, Mexico, and Cuba. But his best efforts could not counter a confessed improvidence that frustrated financial security.

from which I expected to make some views but the P.M. was so windy I could do nothing. Spent most of P.M. fixing up 11/14 camera & dark box. . . . Hoggie, the mule that carried the pack, traveled so roughly that . . . I found the glass all smashed to bits & all one side of the bath holder punched full of holes. It is going to bother me now to replace it. Spent two or three hours in general repairs. I dont think I ever had so inconvenient an outfit. . . ." Even for a master practitioner, it never got easy.

IT WOULD get easier, though. Early in 1879 Congress combined the several competitive annual surveys it had been funding into the United States Geological Survey, and Hayden lost the hotly contested leadership of it, first to Clarence King, then to John Wesley Powell, conqueror of the Colorado (and later a founder of the National Geographic Society). There was no provision for a staff photographer, so Jackson sought new work—presumably less arduous than the Hayden forays. At the same time photography began to move beyond cumbersome, temperamental wet plates into an era of pre-coated dry plates and more portable cameras.

Railroads continued to hold a fascination for Jackson. Preceded by letters of recommendation from rail magnate Jay Gould, he arrived in Denver in 1879 to open a studio, hoping to obtain lucrative photo assignments from the ever expanding railways: "Denver was the place. I liked it there, the climate, the splendid mountains. I liked the people. . . ." Also, Western railroads were headquartered there, notably the Denver & Rio Grande, for which he soon was photographing, traveling about grandly in the president's private car or with his own special engine and mobile photo lab. This was far easier, indeed, though Jackson did not hold back from scaling a peak or canyon wall for the spectacular shot.

Soon he was getting jobs from other Western lines, then in the East. There was travel aplenty for his whetted taste, to every region of the U. S., to Canada and Mexico. Between trips there was the studio to see to and family life in Denver. It would have been the best of worlds, except that his studio, for all his enterprise, sank steadily into debt.

Then came a chance to make things better—and to see even more far places: In 1894 he was appointed photographer for the World's Transportation Commission. Brainchild of

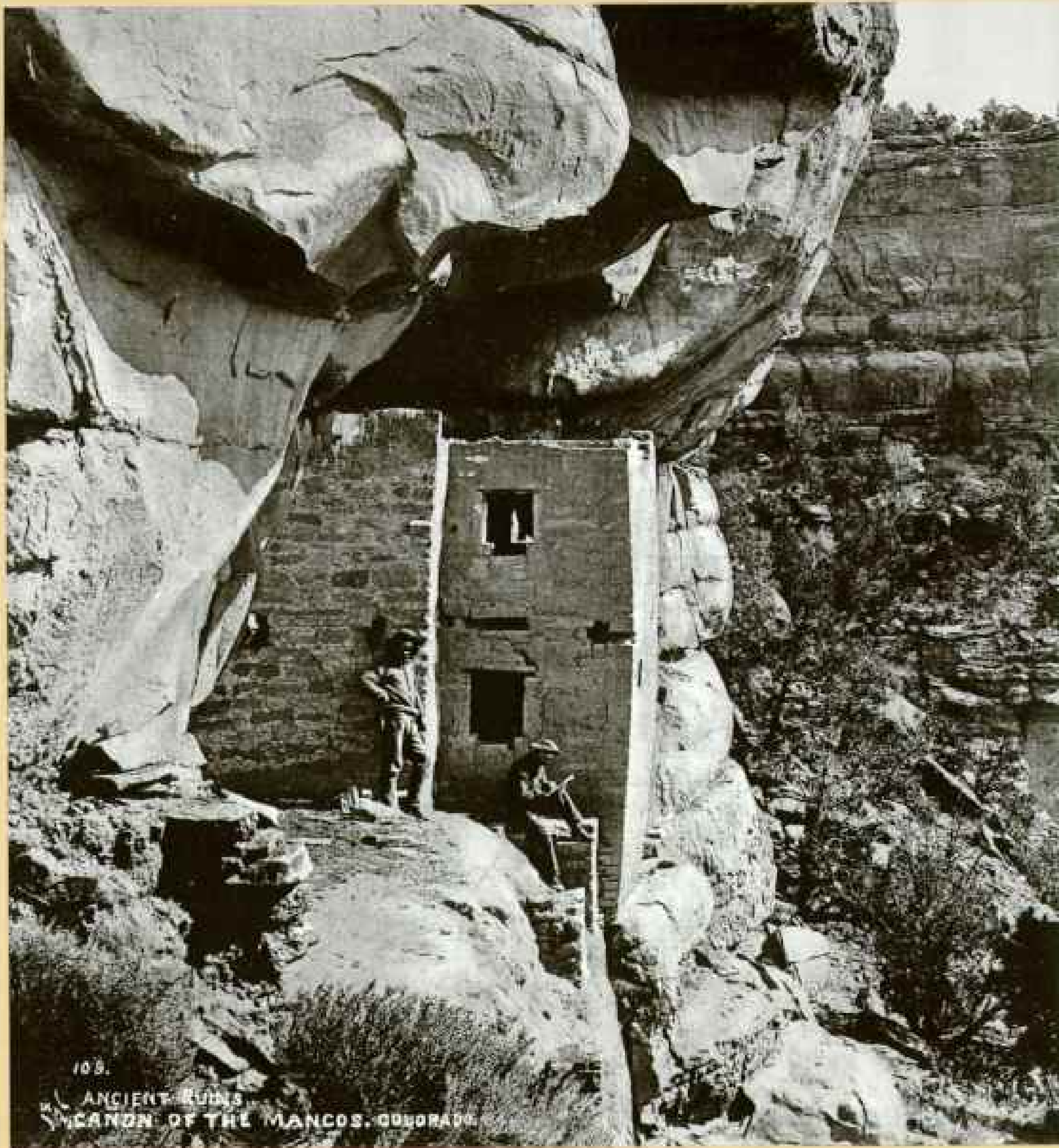
Joseph Gladding Pangborn, a spellbinding Baltimore & Ohio press agent, the commission would draw on some \$100,000 contributed by industrial magnates to travel abroad and study the world's railroads. It had impressive credentials, a grand send-off, and no clear purpose. Other commission members tried to pin Pangborn down on what they were supposed to do, but Jackson never had that problem. He was a photographer; he would take pictures.

Across far lands and seas they went—Europe, North Africa, Asia, Australia—often in style, enjoying varying degrees of pomp. In India there was a durbar held by the Maharaja of Jammu and Kashmir, where Jackson's refusal to wear a Prince Albert coat turned Pangborn "grouchy toward me all day."

From China and Korea Jackson entered the Empire of the Tsar, visited a prison camp, and photographed convicts at work on the Trans-Siberian Railroad. Before winter's freeze-up he traveled in a flat-bottomed stern-wheeler captained by a New England-born, Mississippi-trained virtuoso of profanity who was "damned proud to have some folks from home to visit with." Silent as to photographic problems posed by the subarctic cold, Jackson noted that he was barred from taking general panoramas "because Lieutenant had been instructed to allow nothing that did not have a distinctive railroad motive."

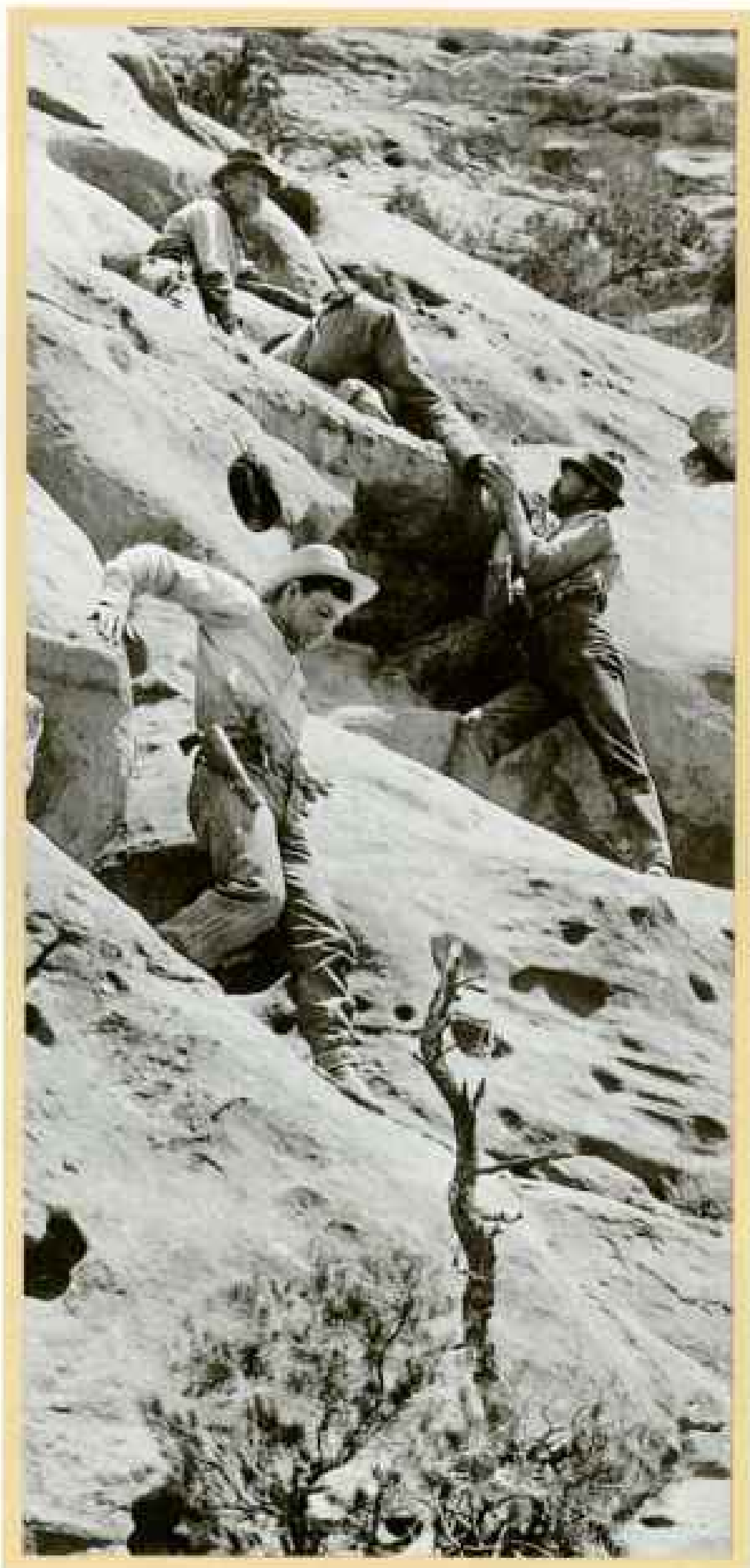
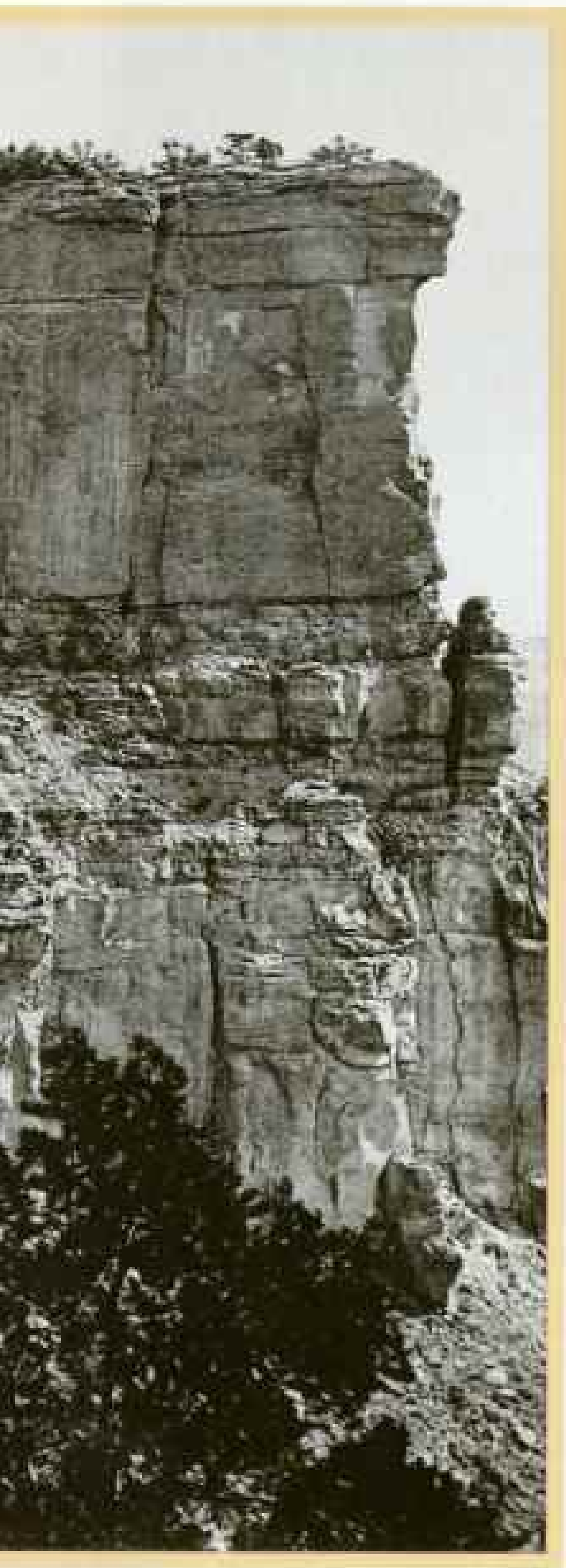
Because the railroad wasn't yet finished, he crossed Siberia by sled during six midwinter weeks, when frozen rivers became roadways for relay teams of shaggy little ponies. He shared a sled with the ponderous Pangborn on hummocky ice, "bobbing us around like corn in a hopper." Cocooned in an oversize elkskin coat, felt boots, astrakhan cap, scarf, and mittens, he peered out with keen interest at passing freight sledges that kept the empire's commerce moving through subarctic winter: "We passed them at all hours of the night, when they had a ghostly aspect." He photographed princes, peasants, and log settlements not unlike those in the American West.

After 17 months the commission's money ran out in St. Petersburg, with the itinerary far from completed. Though he had received no salary, Jackson came home with a grand variety of salable pictures and the reputation that had come with his periodic travel reports published in *Harper's Weekly*. Soon he put together a lantern-slide lecture about it all: "100 Minutes in Strange Lands."



105.
ANCIENT RUINS
NEARBY OF THE MANCOS, COLORADO.

LIGHTNING autographs the sky over southwest Colorado's Chimney Rock, also called Jackson Butte for the man who first photographed the area's cliff dwellings. A canyon near Casper, Wyoming, also honors him, as do peaks in the Wind River Range and central Colorado Rockies near the Mount of the Holy Cross. He had a hero's burial in 1942 in Arlington National Cemetery, and a World War II Liberty ship bore his name.



MUSEUM OF NEW MEXICO (LEFT); UNITED STATES GEOLOGICAL SURVEY PHOTO LIBRARY

HOUSE that Jackson photographed in 1874 still clings to its lofty niche (left) just outside Mesa Verde National Park, continuing under Indian proprietorship—in this case the Ute—by chance of a boundary line's placement. Guide John Moss, standing, and journalist Ernest Ingersoll shared in the experience, described by Will as "worth everything I possessed." He recalled that attaining the terrace, about 800 feet above the valley, was a clutch performance: "With the aid of an old dead tree and . . . some ancient footholds, we finally reached the bench."

TAMING THE LANDSCAPE, Jackson captured graceful calm in an 1890 view of New York City's Harlem River. Washington Bridge arches reflectively over sporting boatmen, in contrast to the unsettling sweep of wilderness scenes that first won him fame.



BACK HOME in Denver, Jackson found his studio still struggling. He solved the problem in 1897 by joining a firm that would become the Detroit Publishing Company, receiving \$30,000 in cash and stock in a swap for his huge inventory of photographs. A catalog of illustrations from around the world was the firm's ambitious goal, including a print of just about any subject you might want, Niagara Falls or the Great Pyramid, copies of Rembrandts or "Washington Crossing the Delaware." Picture postcards were a major line. A secret lithographic process, whereby hand-tinted prints could be mass-produced, rivaled some of the best color work today.

In 1903 Jackson quit commercial field photography to supervise his company's production. He became a stay-at-home family man, took up golf, and lived perhaps the quietest two decades that his long life would know. His wife, Emilie, died in 1918, and in 1924 his firm

went bankrupt; Jackson, alone but still healthy at age 81, decided to "retire," first living in Washington, D. C., and from 1929 onward in New York City. But he never really retired, accepting research work with the Oregon Trail Memorial Association, traveling the old trails each summer, doing paintings, articles, interviews, setting down his life's story, carrying on a prodigious correspondence.

AS I HAVE WRITTEN this story about Jackson, there has been a presence looking over my shoulder, a zealous amateur historian and collector of Jacksoniana, the late Elwood P. Bonney of Madison, New Jersey. His trove of letters, photographs, picture portfolios, scrapbooks of newspaper clippings was made available by his family. So comprehensive were the "Bonney papers" that I soon was having imaginary conversations with Elwood, hearing him describe a typical visit with Jackson

GENTILITY ON TOUR, decorous anglers line the Rio Grande at Wagon Wheel Gap, Colorado, an 1881 shot made during a promotional excursion to provide scenics for the Denver & Rio Grande. Private railcar contrasted to rugged earlier travels.



MUSEUM OF THE CITY OF NEW YORK (OPPOSITE); COLORADO HISTORICAL SOCIETY

at his New York hotel in his final years:

"When I'd knock on his door at the Latham, he'd always respond with a cheery 'Come, come.' I'd find him busy, often at his easel, set to catch the north light from his ninth-floor window. He'd ask my comment on the painting, some Western scene, say Independence Rock or covered wagons fording the Platte, and we'd talk about it. His memory was keen, and he had a way of making you see the places he'd been—the things he'd done.

"If I called before lunch, we'd adjourn to the Automat, where I'd have my standard—cream cheese and marmalade on raisin bread—and he'd have his—a slab of pie (he liked apple, pumpkin, lemon meringue) and milk or coffee. He could eat almost anything. If I called in late afternoon, he'd offer a 'snorter' or 'dust-cutter' of Scotch someone had given him. He'd lift his glass and say, 'Mud in your eye—whatever that means.' Then we'd go to dine at Child's or the Great Bear."

IN 1940 JACKSON NOTED with satisfaction that the *GEOGRAPHIC* had recently published one of his historic Yellowstone pictures. Yellowstone, the linchpin in Jackson's career, was pivotal in his thoughts, and it became pivotal in his country's thinking this past summer when wildfire swept more than a third of its 2.2 million acres (see story on page 255).

The sweep of cyclic surface fires has no effect on the geologic wonders for which the park was created, themselves driven by the lingering fire of an ancient volcano. "The basic plumbing is still there," park historian Timothy Manns commented in reference to the geysers, the hot springs, the Yellowstone River's two-stepped, 417-foot plunge into the park's awesome namesake canyon. As flames closed on park headquarters at Mammoth Hot Springs, ultimately stopping only 1.2 miles short, Tim's concerns had focused on moving 26 Jackson photos and 23 Thomas Moran

paintings and sketches from museum walls to safe storage.

Fire, of course, is just one agent of change in a landscape that may seem changeless, yet is never the same. On an earlier visit to the park I had asked Tim Manns to help me find the site of a famous Jackson shot of his friend Moran on the hot springs' Jupiter Terrace—and got a discouraging word: "You'll never find the exact spot—because it's changed. You're dealing with land surface that's among the newest and fastest changing on earth. The minerals in that water can build up eight inches of new deposits a year, so what we're seeing now is quite different from what Jackson saw."

The challenge of photographing the recent fires would have excited Jackson, as did a problem that he faced at Tower Falls in 1871. He needed a picture from the base of the 132-foot falls but could get his cumbersome dark-room box no nearer than the top. So he prepared his wet plate there, backed the plate holder with wet blotting paper, scrambled down to his waiting camera at the base, and made an exposure. He wrapped the exposed plate in more blotting paper and clambered up to develop it in his darkroom box before it could dry. He repeated the round-trip four or five times, ending the day exhausted but happy with his pictures.

The intrusion of roads and inns and stables and gas stations into Yellowstone has marred limited vistas and stirred controversy. On the conservation side, protecting wildlife has produced its own problems. As the park shifts from sight-seeing buses to snowmobiles after hosting 2.5 million visitors in its 117th summer, debates swirl over proliferating elk and buffalo that invade adjoining cattle range.

And where have the bears gone? Deeper into Yellowstone wilds, say park wildlife specialists, citing a program of weaning grizzly and black bear from decades of scavenging park garbage dumps, making them wild and free again. But critics raise charges of deliberate removal—even elimination—as policy, and debate over numbers of grizzlies ranges from an optimistic 350 to less than half that figure.

The hazards of facing a grizzly never change. Jackson found those hazards to be "spine-tingling" on his last visit to Yellowstone with the survey in 1878. Beside the Yellowstone River, a great silvertip confronted Dr. Hayden and Will: "His eyes glared angrily, and the grip of his claws showed that he was

LIFE COME FULL CIRCLE finds Jackson near Yellowstone at 97, snapping color pictures with his new 35-mm Kodak Bantam, rounding out his hands-on experience with the major advances in photography's first century. His annual Western trips renewed him: "Spring fever is rising and sometime next month will figure on plans for the getaway."

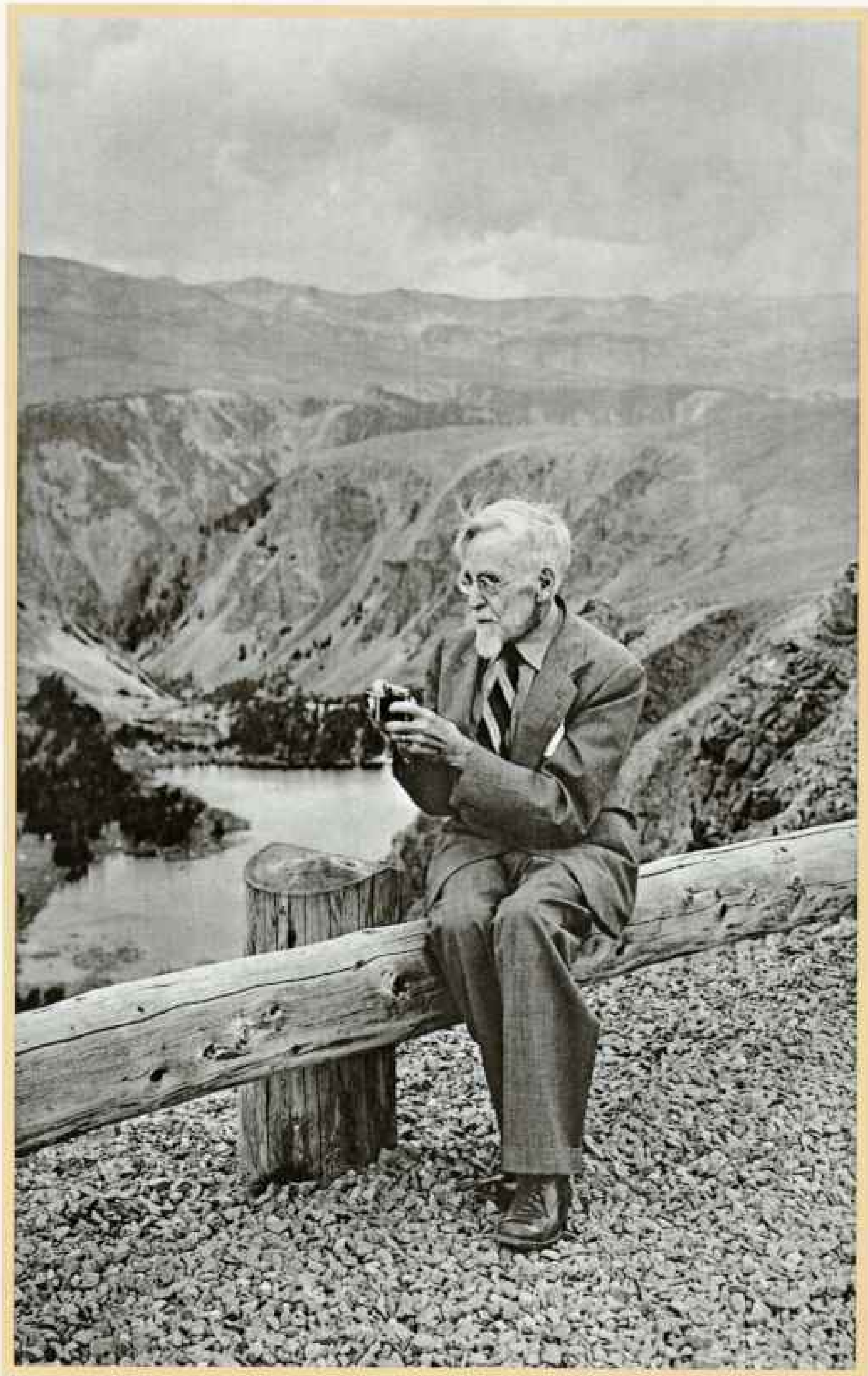
preparing to spring." Will dropped to one knee and fired a rifle shot: "It was one of those times when a man acts first and thinks—if he is fortunate enough—afterward. . . . Without sound or struggle the grizzly crumpled in the snow. . . . Not until the skull was bared did we find that the shot had entered one nostril and crashed through his brain."

Park planners today wrestle the bear of too many people and cars, not enough funds and facilities. Staffs stretch thin, interpretive specialists double as administrators, rangers carry side arms to deter crime.

But despite such problems, Yellowstone prepares for another season of offering millions a wilderness experience. And it was Yellowstone that sowed the seed of a national-park concept now spread around the world—a rich legacy of perpetuating the wild domain.

In the words of Yellowstone historian H. M. Chittenden, it was Jackson's pictures and Moran's sketches that tipped the scales in Congress back in 1872 toward creating the first national park: "They did a work which no other agency could do and doubtless convinced every one who saw them that the regions where such wonders existed should be carefully preserved to the people forever."

DURING that historic 1871 summer in Yellowstone, an Army expedition covered much of the same ground as the Hayden Survey. The Army party also had a photographer, T. J. Hine. But Hine got back to his native Chicago just in time for his negatives to be consumed in the Great Chicago Fire. And an obscure photographer with the Hayden Survey vanished afterward into his native Montana with his few frames. Will emerged from that summer's work as the only one of the three to win acclaim for his published photographs—and they were good and they were effective. That Jackson luck again? Will thought so. He acknowledged a debt to Mrs. O'Leary's cow. □



NATIONAL PARK SERVICE

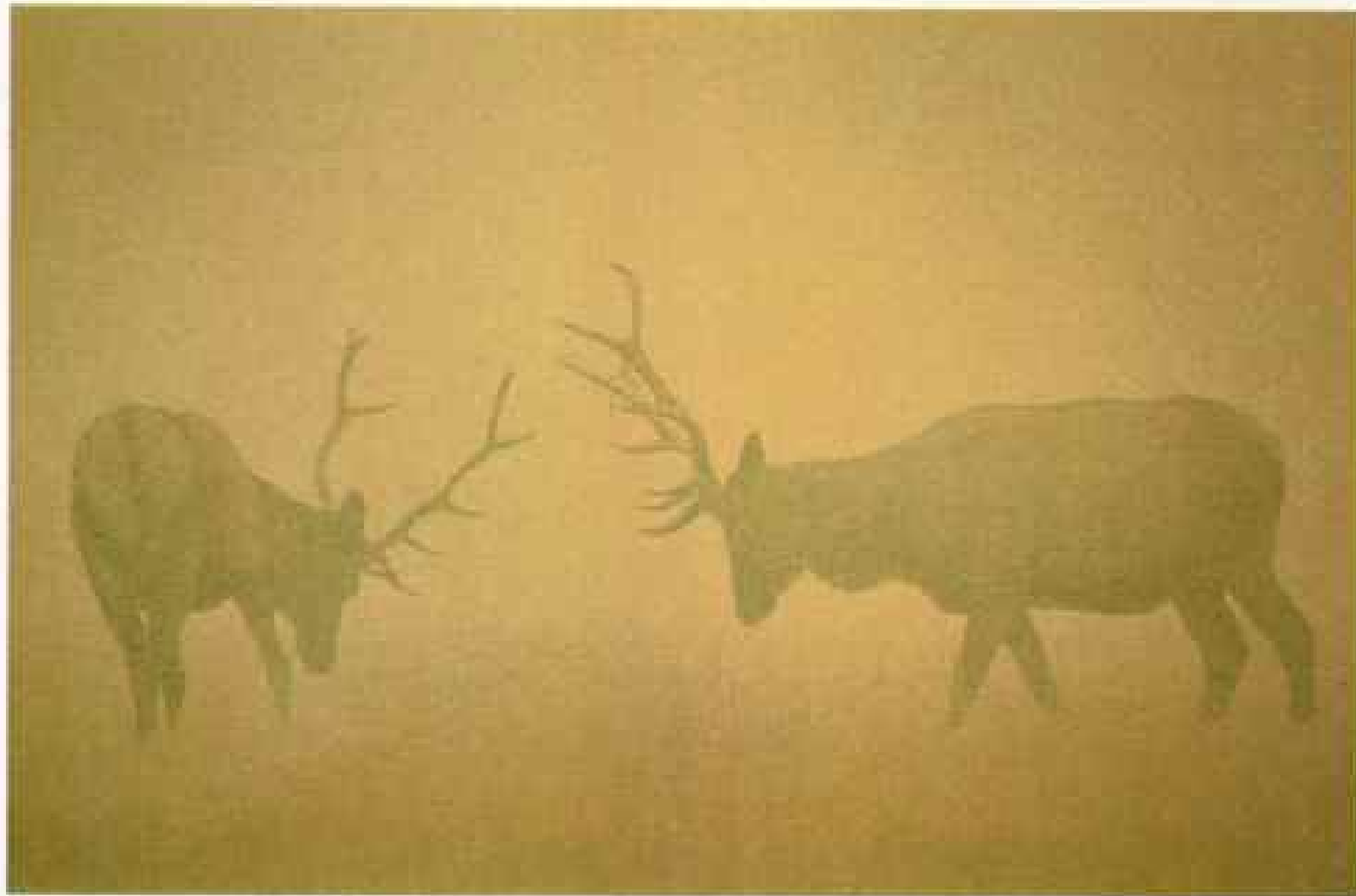




Yellowstone

The Great Fires of 1988

By DAVID JEFFERY
NATIONAL GEOGRAPHIC SENIOR STAFF



MICHAEL S. QUINTON (ABOVE); ALAN AND DANDY CAREY (OVERLEAF); CRAIG FUJII, SEATTLE TIMES

All any fire fighter could do was walk away. The fire had seemed fairly distant—then a wall of flame blazed up out of nowhere (right). Last summer's astonishing wildfires swept through 1.4 million acres in and around our oldest national park. The National Park Service also felt heat for allowing some early fires to burn. On September 7, in a scene that only Dante could have imagined, flames driven by 50-mile-an-hour gusts advanced on Old Faithful (overleaf). Old Faithful Inn, at far right, escaped, but 24 smaller buildings burned. Sparring bull elk took the smoke in stride, as did most wildlife.





IT WAS THE WORST DAY of a summer when cold fronts came whistling through with high winds and lightning but almost no rain. On August 20, 1988, wind-driven fires in Yellowstone National Park and the surrounding area advanced into 160,000 new acres, 62,000 of them inside the park. (In the 116 previous years only 146,000 park acres had burned.)

By the time the conflagration—one of the greatest in U. S. history—was contained in autumn, the historic Old Faithful Inn and the towns of West Yellowstone, Cooke City, and Silver Gate had been threatened with incineration. Despite the efforts of some 10,000 civilian and military fire fighters, fire had invaded nearly a million acres of Yellowstone, or almost half the park's territory—45 times more than in any other recorded year. The fires burned with varying degrees of intensity, and much of the burn was relatively light, giving promise of early recovery. The resulting pattern was often described as a mosaic, though it was as irregular as the coat of a calico cat.

To some the eight huge fires seemed catastrophic and disgraceful, the result of negligence or stupidity. To others they seemed nature's signature written with a grand flourish on an awesome scale—and a reminder that humanity's powers have limits. For most, perhaps, feelings were mixed. Cannot we have our wilderness wild but keep it safe, keep it *nice*?

Summer started in an ordinary way. Technical indicators and previous experience had flashed no alarms by early June, though the park was in a regime of long-term drought punctuated by months, like May, of heavy rain. Most of the season's first lightning-caused fires fizzled out, as was typical.

Human-caused fires were put out, under long-standing orders.

From the 1880s to the 1970s park policy was to put out *all* fires as soon as possible. In a way, that policy was like loading up the park with kindling. Yellowstone's dry climate and long winters greatly retard the removal of dead wood through decay. Much of that 90 years' worth of kindling was still on the ground in 1988.

The great controversy of 1988 arose from a more recent policy that critics tagged "let it burn." The actual policy, in effect for 16 years and spelled out in the current "Wildland Fire Management Plan for Yellowstone National Park," gave park officials discretion in handling fires ignited by lightning or other natural forces. Such fires were monitored daily but were allowed to burn if they posed little threat to life or property.

The policy was rooted in the idea that fires set by natural ignitions do a number of important jobs in tending forests and making meadows. The fires' burn patterns, randomly written across the parkscape, promote regrowth of diverse vegetation types of different ages. Those patterns in turn support diverse animal life. Such fires also periodically clean out areas of deadfall—old kindling—and other forest fuels that can burn easily. Finally, natural fires burn fire-break corridors through and around expanses of otherwise solid forest, thereby reducing the risk of catastrophic fire spread. So, under the policy natural fires were monitored but not routinely put out.

ON JULY 21, with fire in about 16,600 acres (high, but within historic limits), park managers designated all natural-ignition fires as wildfires to be



suppressed. The situation was clearly much more serious than the analyses of early summer had predicted. And rain did not come. The fires kept growing and growing despite all efforts. Then came the calamity of August 20.

By September 6, when more than 9,000 fire fighters were



JAY DICKMAN, MATRIK

engaging fronts all across the Yellowstone region and many thousands more were deployed on other raging fires all across the West, the defense of Old Faithful was under way. That famous geyser of regular habits was not in danger, but the hotel built near it was. Old Faithful

Inn, opened in 1904 and known as the world's largest log structure, stood as a nationally significant landmark. Inside, its lobby rose with a cathedral's gloomy grandeur 92 feet to the ridgepole—a perfect design for a bonfire.

As it advanced on Old

In an eerie convoy, dozens of carloads of journalists evacuate the Old Faithful complex late on September 7 as spot fires flare. "When a blast of heat hit me in the parking lot about three o'clock," says photographer Jay Dickman, "I knew things were serious."



Faithful, a front of the North Fork Fire muttered about two miles to the southwest. One of eight giant fires then gnawing at the park, it had been ignited by a careless woodcutter on July 22 in Targhee National Forest along the park's southwestern flank, and it soon burned into the park.

Even for a gigantic fire North Fork was overbearing and, driven by shifty winds, treacherous. It had burned into Yellowstone and stands of lodgepole pine where more than half the trees were tinder ready, having been killed by a massive infestation of mountain pine beetle some years before. North Fork had turned and burned back across the park border into Targhee—even incinerating regions that had been recently clear-cut. It had burned up to the town of West Yellowstone, burned along and jumped over park roads (and so became the most visible of fires to visitors), jumped the Madison River, jumped the Firehole River.

It had swept the crossroads at Madison Junction. It had snarled up to the visitor complex at Canyon Village. It had become so big that a second command was established to battle its northeast salient.

Defenders of the Old Faithful complex had one central advantage born of an odd similarity. The great ark of an inn sat on nearly treeless ground. Barrenness to its north and east was a by-product of geothermal activity, including the celebrated geyser. Barrenness to the south was a shield of parking lots.

Farther south, across the entrance roadway, troops of the U. S. Army's Ninth Infantry Division (Motorized) under Staff Sgt. Carleton Thomas were cutting and clearing trees from around a power substation that provided electricity to the



BOTH BY JAY DICEMAN

Abandoning Old Faithful, concession employee Lee Stewart left along with hundreds of other personnel and visitors. On the same day about 25 miles north, 50 acres were incinerated by a rare, powerful event called a fire storm. Tornadic winds roared through the area like a freight train. White smudges (left) show the remains of trees consumed by the inferno, which also shattered boulders. In 1976 the same area had burned, creating a natural firebreak to anything but a fire storm.

complex of inn, lodge, stores, cabins, employee housing, and maintenance buildings. Regular duty for Sergeant Thomas's men was training with lasers to spot enemy targets for the battalion's 155-mm howitzers:

"We're a motorized division, but you can't count on those tires and those wheels. Sooner or later everybody is straight-leg infantry."

THE ARMY had been here before. In August 1886, 50 men of Company M, First U. S. Cavalry, took control of the park to establish law and to suppress, according to Capt. Moses Harris, "destructive forest fires [that] have been raging in the park during the greater portion of the present season."

The Army was back in 1988 because trained and experienced fire crews had been stretched thin to transparency fighting blazes throughout the West. Once during the summer calls had gone out for 139 crews, but only 40 were available.

While Sergeant Thomas's men were hacking out firebreak around the substation, civilian volunteers from the town of West Yellowstone were laying and connecting irrigation pipe for a sprinkler system to wet down a corridor beneath incoming power lines. The pipe was on loan from Mormon farmers in Idaho; the same kind of setup had been used earlier in the defense of the town of West Yellowstone.

Late that same afternoon Denny Bungarz, overall chief on the North Fork Fire, was summarizing the situation: "The fire is coming up a ridge now. We expect it to break over that ridge and back down the hill. A backing fire [advancing into the wind] is a much easier fire to control." That is, if the wind held. With 36 years in the fire business Bungarz knew too well how fast that could change.

Sounds of talk drifting through the great spaces of the inn—conversations in French, in German, in various shadings of Commonwealth English—were reminders that the park's public is international. Yellowstone, the nation's and world's first national park, is a UNESCO world heritage site and biosphere

Brutal hours and conditions take their toll on California fire fighter Paul Bloom (right), working on a spot fire near Mammoth Hot Springs. Amid powder-dry conditions near West Yellowstone, another crew builds a fire line. Some 9,500

men and women came from as far away as Florida, including 4,200 military personnel who pitched in on the ground and also provided air support. The sole fatality came when a snag charred during the Clover-Mist Fire toppled onto a fire fighter.



reserve. It is also a superb place to fish for trout, or to hike into the backcountry, or to pack the family into a camper and drive on through. Yellowstone has many publics with many, sometimes conflicting, expectations.

An expectation of fire fighters is that night will be their ally, but it was not much help in 1988. Fires could not easily be attacked in darkness for the danger of falling snags. Night wind was another adversary. It ran from high ridges down along river and creek drainages, cascading like airy rapids, waking smoldering fires and bearing them downstream.

This contrary behavior got tagged the "Milo wind effect" for Milo Radulovich, a meteorologist on the North Fork Fire. He had a short answer to the question "Is this summer of fire different from others in your experience?"

"Hell, yeah, it's different! It resists efforts to suppress, mainly because of the weather. It's as if it has a warped personality: 'I'll show these puny little men what the hell it's all about!'"

One of its perversities had been observed by Dave Thomas, a specialist in fire behavior for the Forest Service who teamed with Radulovich on North Fork. Even small fuels like needles and twigs, he found, were absorbing almost no moisture during nighttime periods of higher humidity.

Much of Yellowstone was like an unimaginably huge lumberyard, where twelve-by-twelves in the millions upon millions were each stuck on end, spaced far enough apart to allow good air circulation but close enough together for each to torch its neighbors. Such were the dense stands of old-growth lodgepole pine, most of them designated

LP4. Denny Bungarz called them JP4, shorthand for jet fuel. That was a slight exaggeration; by August even fallen trees in Yellowstone were no drier than hardwood flooring.

Morning on September 7 brought a revised forecast: winds southwest about 20, with higher gusts. Given what could happen, Old Faithful Inn was declared closed, though guests had ample time to breakfast, pack, and check out, which they did in a calm spirit of cooperation.



BOTH BY JAY DICEMAN

By afternoon Denny Bungarz was still expecting fire to back in. "I suspect it will hit us in fingers—a little finger here, little finger there."

Instead, the fingers curled together, and it came like a fist.

What follows are impressions of the fire's attack, made at Old Faithful by talking (or yelling) into a tape recorder:

3:23 p.m. Large wall of roiling black and brown smoke about a quarter mile away. Four-engine aircraft are flying

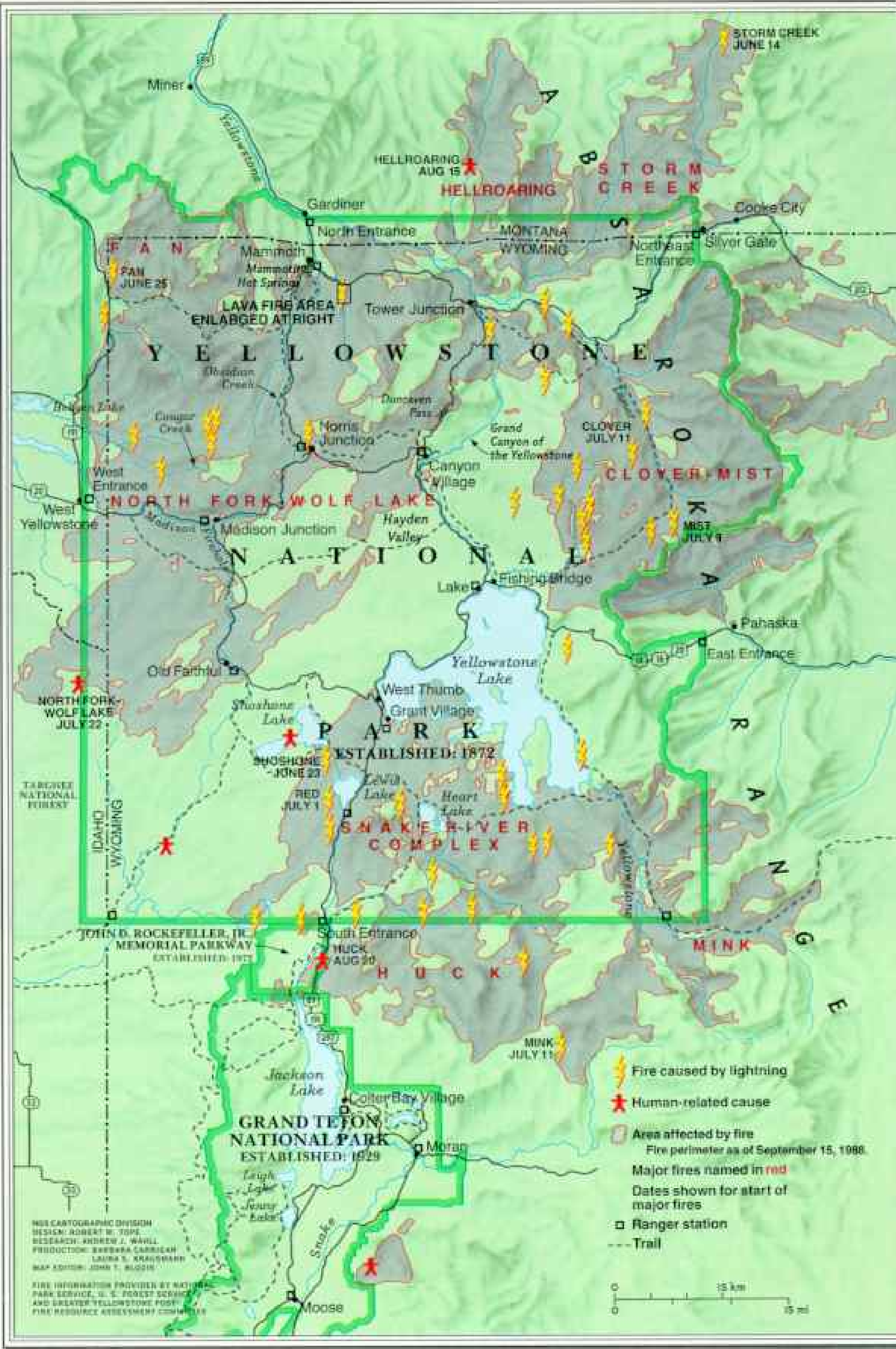
... fire-suppression chemical drops.

Wind shift. Almost from the north at 3:53. [Winds were actually blowing in from all around the compass to replace the column of hot air rising from the fire.]

4:04 Wind about 50 miles an hour now. . . . Fire is to the left, right, and center. . . . The roar sounds like a continuous jet takeoff. . . . Now we're completely surrounded by red flames. Sparks everywhere.

. . . There's fire now in the [nearby] trees. . . . It's obviously jumped the line. [Fire crews had by now been pulled back to the parking lot area.]

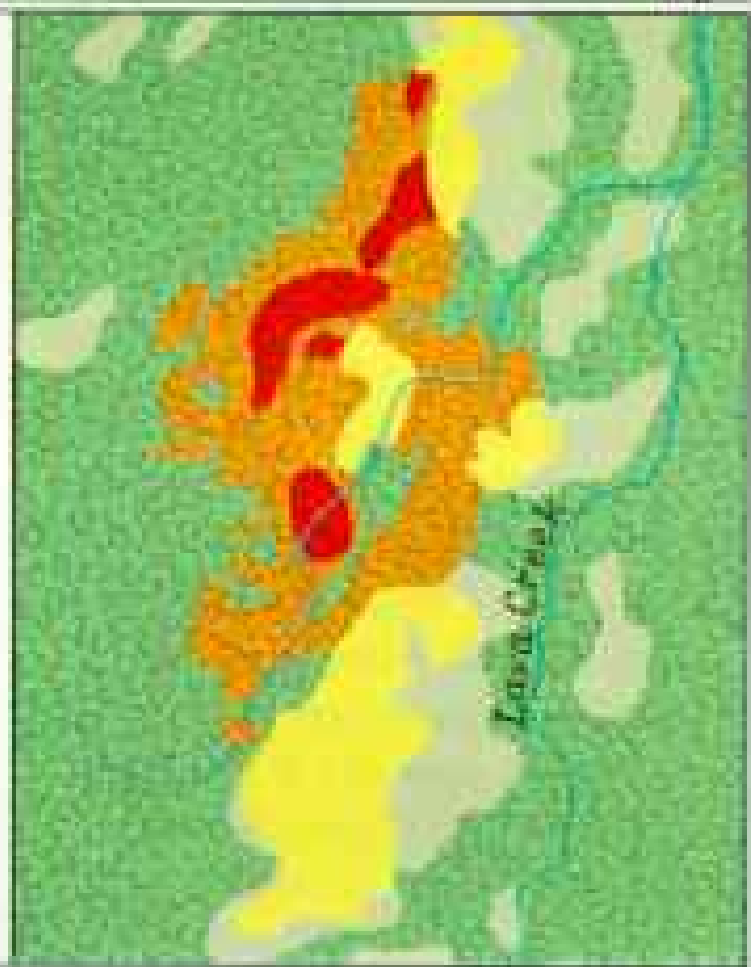
Spot fire on the other side of the geyser area. Almost due east, climbing up that ridge. Spotting up to a mile away. [The critical wind shift came from the west, and the fire began lobbing sparks and firebrands right over the parking lot, the inn, and the geyser basin and igniting woods on a slope beyond. The wind



Lava Fire

Typical mosaic of different burn intensities resulted from this small 70-acre fire, which started July 5. Effects range from unburned islands of forest to hot crown-fire areas awaiting long recovery.

-  Unburned forest
-  Unburned meadow
-  Meadow fire: 0-1 year recovery
-  Surface fire: 1-10 year recovery
-  Crown fire: 10-100 year recovery



Yellowstone Fires: 1988

WITH A VORACITY unrivaled in Yellowstone since the early 1700s, eight huge fires swept through nearly half of the park's 2.2 million acres. Extreme conditions arose when a severe drought continued into early summer. Almost no rain fell during July and August. Relative humidity dropped as low as 6 percent. Incredibly, most deadfall contained less moisture than kiln-dried lumber. Although human

carelessness touched off several fires, most were ignited by lightning and advanced as far as 14 miles a day, whipped by dry, gusty cold fronts. Officials allowed several early fires to burn un-suppressed, following a 1972 Park Service policy that encourages fire's natural ecological role. But prior to that, all fires had been fought routinely for 86 years, adding to a buildup that exploded last summer.

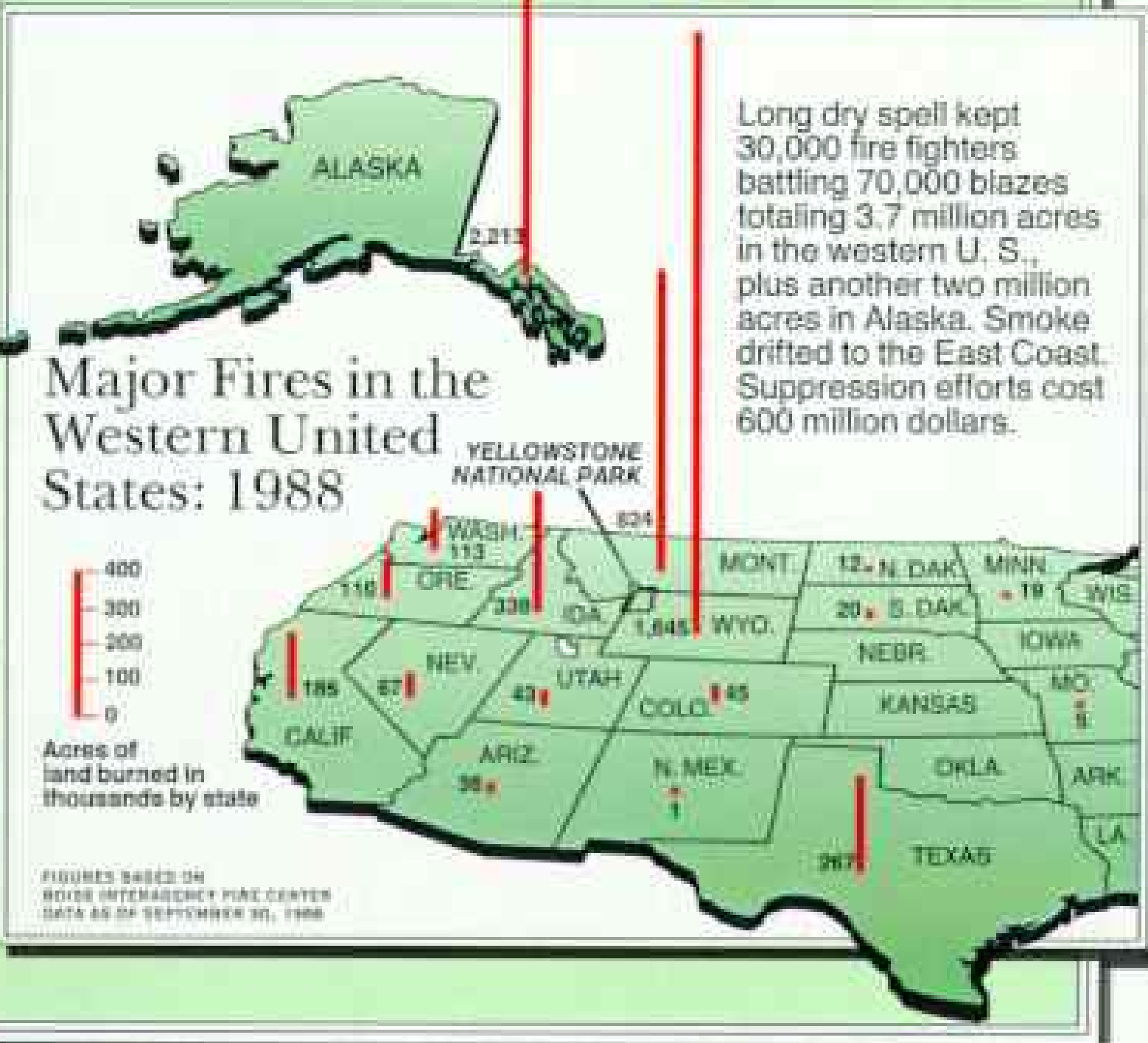
shift probably lasted no more than five to ten minutes.]

... Colors: Black crown fires, roiling orange-gray, gray-green smoke, rolling and tumbling. Occasionally it stops and you can see right through. ...

The danger passed, abruptly, as the fire bore off to the north-east. The inn was saved by keeping it wet down; the power lines to the substation were saved by the sprinkler system. The North Fork Fire now had other business and other policy to dictate.

ON FRIDAY, September 9, fire crews boarded a school bus from Salmon, Idaho, and rolled out of the Madison Junction fire camp with a mission: to pin an outrider of North Fork against Cougar Creek and bottle it up near the park's western boundary. North of West Yellowstone the bus turned off Route 191 and lurched along to a bluff above the Madison River. The crews dismounted and hiked a mile or so through old growth, new growth, and meadow—the calico pattern left by fires of other times. The day's job was to dig new fire line by hand down to mineral soil. Fire that slowly backed into the two-foot-wide line would be stopped for lack of fuel. It could also serve as a baseline for "burnout," a fire set to burn the fuel between the fire line and the wildfire and so establish a buffer zone. This might work, although at one point in the summer only one mile of fire line held for every 20 dug.

Susan Chambers had come to dig fire line all the way from Cape Lookout National Seashore, where the Atlantic Ocean made policy. She fought fires partly for the extra pay, partly for the comradeship, but mainly for the cause. "Yesterday I think everybody came in feeling



The fires of Yellowstone on September 8, 1988, are here dramatized beyond any conventional means. Neither photograph nor painting, this computer-generated three-dimensional satellite image creates an unprecedented portrait of the park.

The process began with an image of Yellowstone made from information collected by EOSAT's Landsat 5 satellite. Using topographical data, the Analytic Sciences Corporation made a digital terrain model of the park. TASC integrated the model with Landsat's imagery to create this perspective. A view from a 36-mile altitude

was selected, looking roughly east-northeast. The inset map provides a frame of reference.

Peaks of the Absaroka Range, in the background, are somewhat exaggerated, and most smoke has been eliminated by the use of infrared. Rust color shows partially burned mosaics and depicts three major fire groups: the Clover-Mist Fire, at top; the Mink Fire, the Snake River Complex of several combined fires, and the Huck Fire, at right; and the North Fork-Wolf Lake Fire, at bottom.

All were fanned by strong southwest winds when a dry cold front swept through two days earlier, creating the run on the Old Faithful complex, seen near the bottom of a vertical red tongue at lower center.

A fire front glows above West Yellowstone, at lower left. Although that town was not evacuated, others were, including Cooke City and Silver Gate,





where ten homes burned. Park headquarters at Mammoth Hot Springs was also evacuated, as were Grant and Canyon Villages and Norris and Tower Junctions.

Pine needles and other "fine fuels" on the forest floor contained as little as 2 percent moisture. Fires raged even at night, when humidity normally quells them. And a decades-long infestation by the mountain pine beetle had killed many trees, adding fuel. High winds blew embers downwind as far as 1.5 miles from fire fronts.

TERRAIN MODEL AND INTEGRATED PERSPECTIVE BY THE ANALYTIC SCIENCES CORPORATION, READING, MASSACHUSETTS



like we really did something, a sense of satisfaction in slowing a small segment down, though in the grand design it was probably a drop in the bucket."

A glance up through the trees revealed cumulus clouds building vertically thousands of feet so rapidly that they seemed like subjects of time-lapse photography being projected on a big-screen sky. They did not, however, signify rain. They came from combustion and signified a big burn.

So it proved. One arm of the North Fork Fire—called Wolf Lake—had punched up to the borders of park headquarters at Mammoth Hot Springs. Another had thrust to within a quarter mile of Roosevelt Lodge at Tower Junction.

On Saturday morning, September 10, the outlook was grim. Forecasts predicted another cold front, pumping winds of 20 to 40 miles an hour with gusts to 60. At Area Command Headquarters in West Yellowstone, Forest Service fire behavior expert Robert Mutch said: "These are unprecedented conditions. Today, if we get the forecasted winds, people will see fire behavior situations that they've never seen in their careers." Mutch and Richard Rothermel, also of the Forest Service, and Dave Thomas headed up Route 191, passed a roadblock, and went on to where North Fork was on a run.

To the right of the road, fire rolled along on a parallel track, doing what Thomas called the "bump and grind." One fire cell sends sparks and firebrands downwind. These ignite, starting new fire cells. Burning vigorously, the new cells suck air and flames from the parent cell. With time, surges of wind, flame, and energy travel back and forth among cells. This infernal engine had been driving the fires all summer long.



At 11:45 a.m. West Yellowstone Airport's control tower (reached by climbing an extension ladder) reported winds 20 to 30 knots with gusts to 45. The front was blowing through, the worst possible news, *except*—except that cloud cover was 100 percent, and the temperature was falling.

At 1:40 Fred Roach, chief of operations on North Fork, pulled up to the roadblock on Route 191, cranked down the window, and yelled:

"They say it's raining like hell at Old Faithful!"

THE NEXT MORNING snow was swirling in the streets of West Yellowstone. It was blowing past a bundled fisherman on the Madison River who was trying his luck or skill or lunacy.

Near Norris Junction snow was sifting through ranks and rows of charred trees, covering the black earth and wings of lodgepole pine seeds that, released by heat, had glittered on the ground the afternoon before.

Snow dusted bison herds in Hayden Valley and stuck to the



JONATHAN BLAKE

road in Dunraven Pass. It settled with the faintest rustle into the Grand Canyon of the Yellowstone.

Fires would continue for weeks and weeks—scattered fire islands were still burning in early November—but the unyielding weather pattern of dry cold fronts had broken. All summer natural forces had seemed to make league with the fires; now those forces seemed to be at least neutral. Human effort again counted in the scale of things; the worst was past.

Research biologist and expert

in fire ecology Don Despain was soon in the field estimating regrowth patterns. On a blackened hillside he counted lodgepole pine seed wings as he moved a grid along a randomly established line. One type of lodgepole cone opens only when heated; it had done its job.

A few back-of-the-envelope calculations by Despain suggested that if 10 percent of the seeds represented by the wings survived and germinated, an acre would soon have 5,800 trees growing on it. That would be an

Pall of smoke from the North Fork-Wolf Lake Fire shrouds forest and meadow along Obsidian Creek. The burn patterns, branded into Yellowstone's forests—dominated by lodgepole pine—leave a blueprint for future health. They ensure diversity by creating tree stands of varying ages and curbing the invasion of trees into grasslands.



Seeds of regeneration already lie upon the forest floor among lodgepole pine cones. Lodgepoles produce two types of cones. Some open at maturity. Others, like the rust-colored cones, are serotinous and open only when heated—an insurance policy to release new seed immediately after a fire. Red squirrels and other small mammals feed on cones, dispersing seeds. A seep greened with sedges showed signs of life even last September (right), and biologists expect a bumper crop of wildflowers this spring.



JEFF SANDER, ORIS (OPPOSITE); MICHAEL S. QUINN

impossibly large number for one acre to sustain, but the point was made: Life in Yellowstone is self-priming.

The earth soon started to renew itself. John Varley, the park's chief of research, looked forward to a "great increase in plant species, as much as tenfold in 20 years. There will be a rise in fauna too, from insects upward through the food chain."

Some elk and bison had been killed but far fewer than in a hard winter. Burned meadows should be recovered by the summer of 1989. Burned forest floors should be overgrown with ground cover in three to five years. Many mammals and bird species such as bluebirds and

woodpeckers will benefit from the increase of open areas and the especially productive zones along new borders of meadows and woods.

Was, then, the great fire disastrous or beneficial? John Varley responded that the question cannot be answered without considering human values. "Fire to human beings has been a friend or foe as long as there have been human beings. One day it's your friend, and the next day it's your enemy. Certainly to those people whose property or homes or businesses were put in jeopardy, the fires were bad.

"But to an ecologist what happened is neither good nor bad. It's just the natural

progression of things. It's like spring, summer, fall, and winter," though on a much longer time scale.

At the heart of the matter lies a basic question. For Varley, "It's a fundamental argument about how parks should be managed. In the simplest possible terms it's whether we want man as the primary manager of these wild lands or whether we want mother nature as the primary manager."

That most basic of questions was not within the scope of an executive branch task force considering revisions to fire policy in national parks and wilderness areas of national forests. That group's preliminary recommendations were expected to be



A blackened forest is no distraction to the mating urge of a bull elk bugling to his harem along Obsidian Creek. Fewer than 250 of the park's 32,000 elk perished, but because some winter range was ravaged both by fire and drought, they may migrate farther this year, competing for limited forage. Heavy snow could result in a severe winterkill.

made public in February or March. Following their issuance, 60 more days were to be reserved for public comment. Final policy recommendations were to be in effect by May, in time for 1989's fire season. Congressional hearings may also be held.

Few if any Park Service officials proposed totally abandoning the policy of allowing naturally ignited,

nonthreatening fires to burn. The goal was to better judge when factors such as weather and number of fires make that policy untenable.

The policy might be adjusted by more reliance on statistical indicators as triggers to begin suppression of natural fires, more use of planned fires to reduce fuel loads, more extensive removal of fuels from around structures and settlements.



JEFF VANUGA

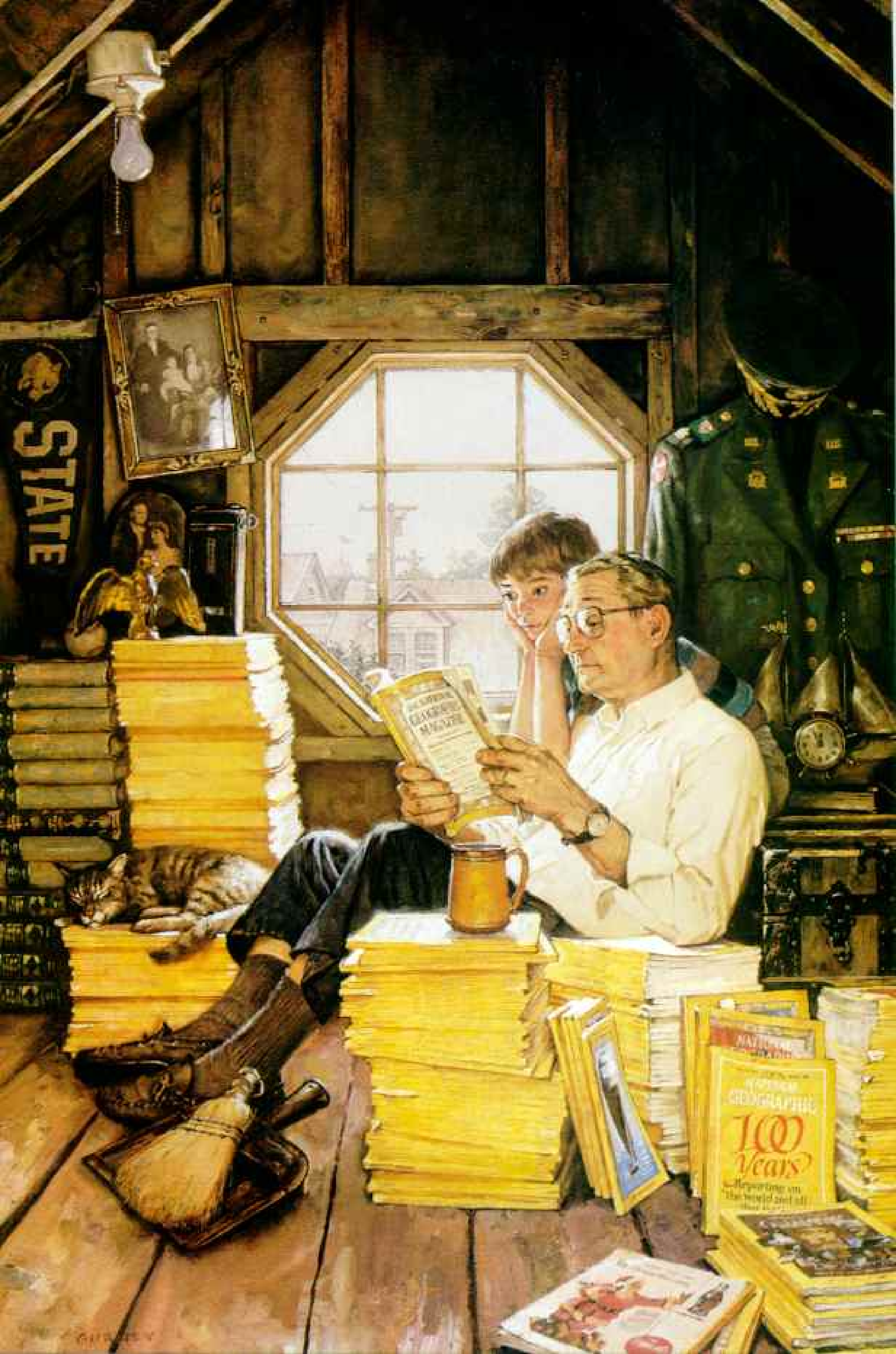
THERE WAS another question. Would people come to see the park, with its blackened stretches and other changes? Visitation in October was the highest for that month in park history.

They came back just as they came back after the earthquake of August 1959, one of the largest ever recorded in the

interior of North America. It stirred up the geysers, reset Old Faithful's clock a bit, dammed the Madison River outside the park boundary, caused general alarm and havoc—and now seems largely forgotten.

Geologist Wayne Hamilton traced another cycle of Yellowstone time. What is now the park was born two million years ago in a colossal volcanic

explosion. A similar explosion about 600,000 years ago was a thousand times as massive as the explosion of Mount St. Helens in 1980. Cataclysm made Yellowstone, and the forces that made it still surge and grumble under the park. They power Old Faithful; they powered 1959's earthquake. One day they will power an event very much larger than the fires of 1988. □



STATE

AMERICAN GEOGRAPHICAL MAGAZINE

AMERICAN GEOGRAPHICAL MAGAZINE
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Celebrating our centennial in the world and at home



Witness to a Century of Change

By WILBUR E. GARRETT EDITOR

A "PORTABLE ATTIC" might be an apt subtitle for this new centennial index to NATIONAL GEOGRAPHIC now on press. The volume organizes for reference more than 7,000 articles, but it also serves as a kind of field guide to the century. Through generous use of illustrations, the index shows the world as it once looked, whether "once" belonged to 1888 or 1988. Such captured moments give, I think, the same sort of pleasure that comes from leafing through old issues of the GEOGRAPHIC.

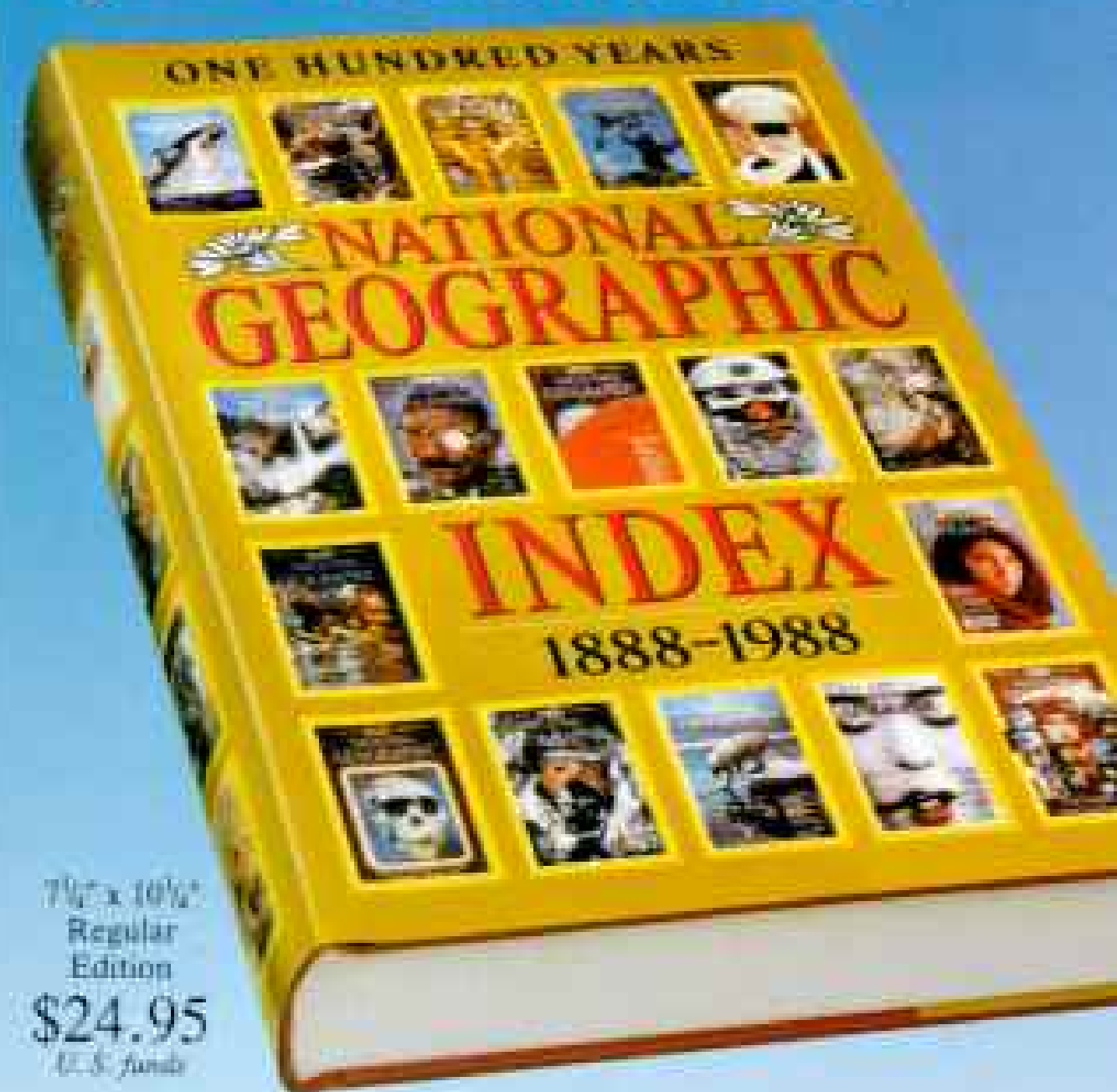
With time, the subject matter, point of view, and technical execution of photography change. Reportage changes as well, even styles of titles. Today we would hardly call radioactive atoms "obedient" and "friendly" as we did in two titles during the 1950s. Just as parents can embarrass their children, so our former attitudes and expressions often seem dated. Put in the broader perspective of two or three more generations, though, and the whole takes on the cast of history.

Consider, for instance, China. Since index entries within subject categories are listed chronologically, reading down a column of titles is like being given a synopsis of history and changing attitudes. Even absence can be significant—like the dog that did not bark in a Sherlock Holmes adventure. None of the few articles under "China" during the 1950s and '60s came from staff then working inside the country; the era's political climate denied us admission.

Or consider this entry: "Populous and Beautiful Szechuan: A Visit to the Restless Province of China, in which the Present Revolution Began." That article appeared in December 1911, and the "present revolution" was the overthrow of the last imperial



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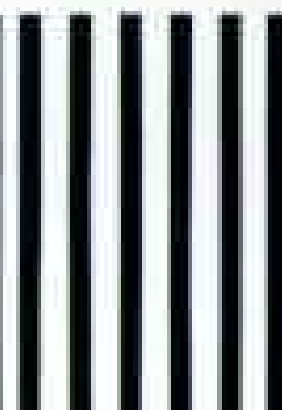


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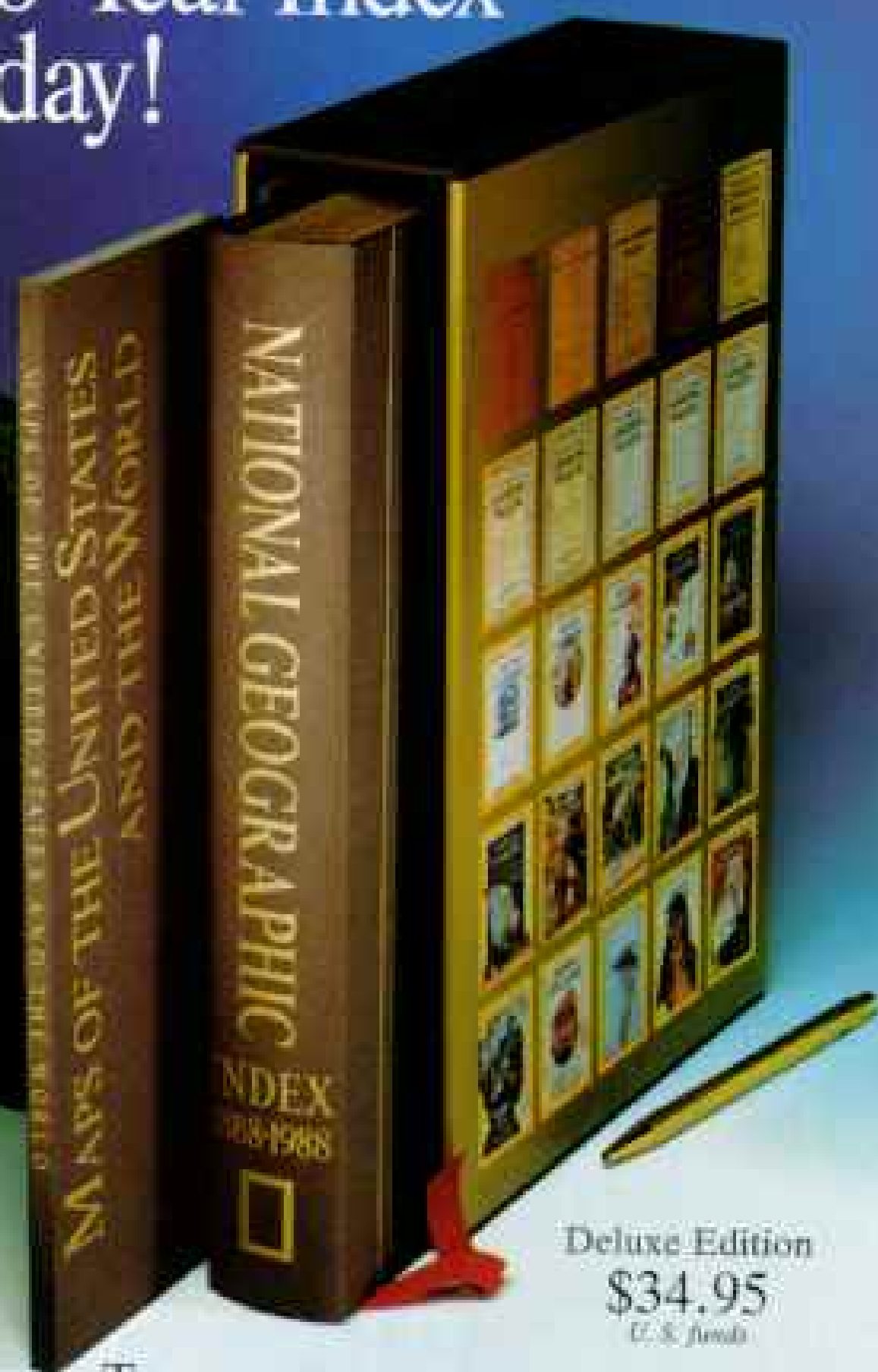
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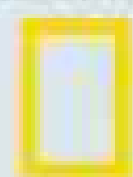
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Lioness and cub in East Africa's Serengeti are among a thousand illustrations—chosen for their individual excellence and collective variety—to be published in the centennial index. PHOTO BY MITSUAKI IWANO

dynasty. It is reassuring to browse through the centennial index and be reminded that NATIONAL GEOGRAPHIC is a longer lived institution than all the people's republics and most of the empires, republics, democracies, and dictatorships of today's world.

The index is meant, above all, to be useful, and its many features are organized to that end, but I can't help rummaging through our hundred-year portable attic. There I can find those landfalls of delight and knowledge I was not looking for. □

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Mr. Goodwrench



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THERE'S NEVER BEEN any place quite like it. It entertains you. It informs you. It tempts you to become involved. It's the most advanced interactive geography exhibit ever created, and we've built it here at Society headquarters in Washington, D. C. We call it Geographica.

"It's a hands-on learning experience," says Jeffrey A. Dering, who designed the new exhibit. "We're putting the world at your fingertips."

Want to talk to a great explorer? Touch a tornado? View the earth from 22,000 miles in space *at this very moment*? Such dreams will become realities when Geographica is completed in 1991. The first phase opened last month in the north end of Explorers Hall. At its heart is Earth Station One, a 72-seat interactive amphitheater designed to let visitors explore our new world globe. At their seats "travelers" push electronic buttons to answer questions from a "pilot" narrator. Their responses are analyzed by computer and displayed on twin video walls.

Computers make possible many of the creative displays in Geographica. Would-be explorers of the deep seas choose among video reports on diving expeditions simply by touching a video screen. The same technique permits archaeology buffs to follow researchers on the trail of humanity's early ancestors.

Visitors concerned about the weather can keep an eye on the latest developments through a live satellite feed or marvel at a man-size twister in our new "tornado machine."

To enter the invisible realm of the very small, museum guests are invited to manipulate robotic microscopes, change lenses, and watch the

magnified images of tiny living creatures appear on a video screen.

By the end of next year students of Maya culture may take a video tour of the city of Rio Azul as it looked during its heyday. Want to explore that alleyway to your left? Just move the joystick in that direction. Curious about that temple straight ahead? Open the door and go in.

Have you ever hoped to see yourself on the cover of NATIONAL GEOGRAPHIC? You'll get your chance at a display called "In the Picture." We'll take a video snapshot of your face, surround it by our famous yellow border, and present you with a copy to take home. In the process you'll learn a few things you didn't know about Society expeditions.

In 1991 we plan to let budding geologists monitor volcanic activity in real time from a thousand sensors spread across a major volcanic site. Biologists can run an evolutionary "time machine"

to explore the endless varieties of species in different epochs. Oceanographers will take underwater video flights over the bottoms of the world's seas. And amateur historians may pose tough questions to video images of great explorers and take delight in their replies.

I'm excited about Geographica because it makes learning fun. And the lessons it teaches are the kind that stay with you for a lifetime. Each display has a map to locate the subject, and there will be computerized reference guides to help teachers find follow-up materials. We're proud of our new Explorers Hall exhibit. I think you'll enjoy it too.

If you'd like to reserve a time for your class or group to visit Earth Station One, you may call (202) 857-7689.



TOOLS OF THE MUSEUM DESIGNER'S TRADE SURROUND AN ARCHITECTURAL MODEL OF THE NEW AMPHITHEATER OVERLOOKING THE GLOBE AT SOCIETY HEADQUARTERS. PHOTOGRAPH BY SISSE BRINBERG

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Members Forum

Ice Age Head

If the ivory head on the October 1988 cover is genuine, it ranks among the most important art history discoveries of our century. As Mr. Marshack realizes, the object's uniqueness demands the greatest caution in judging its authenticity. This caution should extend beyond purely technical examination to the visual qualities of the head itself, and here is cause for skepticism.

The mouth, cheeks, and eyebrows bear a strong resemblance to a statue of Neandertal man done by Frederick Blaschke for the Field Museum in Chicago and even to the reconstructed head of Peking man published in *Palaeontologia Sinica* in 1943. There is always the possibility of a truly remarkable coincidence. I hope that the GEOGRAPHIC will keep us abreast of future developments in this fascinating investigation.

JAMES TRILLING
Providence, Rhode Island

I suggest the following scenario: There are quarries at Dolní Věstonice where they dig loess for bricks. Pleistocene layers are frequently exposed. A villager found a piece of mammoth ivory with some engraved lines made by Ice Age man. Later somebody who knew of Piltdown man, a notorious fake once displayed at the British Museum, or similar reconstructions carved the face using flint tools. The carved hair piece you had analyzed could still show the old surface.

PETER JABLONKA
Klagenfurt-Wölfnitz, Austria

Analysis shows that the hair piece was anciently carved and originally united with the head; both show the iron oxide stains of long burial.

The Search for Modern Humans

The article was generally well written and up-to-date, but almost no women are shown in the re-creations by your artist. That's strange, since the importance of females is demonstrated in their many depictions in Paleolithic art, and since many animals depicted appear to be pregnant. For such reasons, I don't believe the purpose of art was hunting magic per se.

And why hasn't it occurred to anyone that the small footprints mentioned in Tuc d'Audoubert cave (pages 442-3) could have been left during ceremonies in which women were teaching adolescent girls about sexuality, motherhood, and

the importance of women. Especially since there are no large footprints suggesting an adult male leading the rites. In many regards your article has served to further the contemporary bias that women, or the family as a whole, had no role in the beginnings of culture. There is strong evidence to suggest that the opposite was true.

JEAN M. AUEL
Arch Cape, Oregon

Jean Auel is the author of The Clan of the Cave Bear and other novels set in the Paleolithic period.

The Peopling of the Earth

Editor Garrett's characterization of biblical creation as a myth is offensive to many readers. He continues with a misleading generalization, "Scientists dismiss the myths." As Mark Twain said, "There is something fascinating about science. One gets such wholesale returns of conjecture out of such a trifling investment of fact."

JOHN JAEGER
Irvine, California

While your articles did allude to the possibility of earlier habitation in the Americas (pages 437 and 503), they perpetuated the idea that the first Americans arrived here only 12,000 years ago. Such a recent date causes a catch-22 situation in research, discouraging interest and, more important, funding. Researchers who choose to dig deeper often have their finds ridiculed by the "established community" with the statement "Anything found deeper than 12,000 years must have fallen from a higher strata during sloppy excavation." In numerous excavations from Alaska to the tip of South America, signs of early humans go well beyond the 12,000-year mark. With proper funding and interest, the book on early man in the Americas will be rewritten.

DAVID C. BOBB
Sacramento, California

Clovis Points

It was good to see the article on Clovis points from Washington State; the photographs are excellent. However, on the map all sites are in the U. S. Actually Clovis points (and sites) are well documented for northwestern and north-central Mexico, for several localities in Guatemala, and as far south as Panama.

C. ROGER NANCE
*University of Alabama
Birmingham, Alabama*

Moche Tomb

If the excavations at Sipán, Peru, are the greatest find of pre-Columbian culture to date, and if the objects offer great insight into a lost culture, why wasn't a greater effort made to provide that information as opposed to the detailed narrative

of the excavation itself? Surely there was more to the Moche way of life than human sacrifice.

BRIAN KIRK
Seattle, Washington

Hmong in America

It was gratifying to have two of my photographs published (pages 592 and 595). The children pictured are by no means unique. I have been deeply involved with resettlement efforts for six years and assure you the cases of orphaned children as well as of the elderly and the handicapped, all attempting to join relatives in the U. S., can take years. These refugees are the most vulnerable to illness and obscurity, and they deserve higher priority than they have been given.

DOUG HULCHER
Bangkok, Thailand

Concerned supporters of Mr. Hulcher formed a nonprofit, tax-exempt organization to accept contributions: Minors in Need of ReSettlement, 125 West Lewis, Mankato, Minnesota 56001.

As a folklorist documenting the traditions of Southeast Asian immigrants in Atlanta, I read the article with interest. Atlanta's Hmong community is a small one, but its rapid growth tells of economic success. The four families of ten years ago are now more than 170, largely because of the relocation of families from other states. Most are drawn by opportunities to work and to own a home (75 families own homes already). Siang Koua Vanchiasong, director of the local Lao Family Community, Inc., proudly reports an employment rate of 95 percent, with no employable Hmong receiving cash assistance.

JANICE MORRILL
Decatur, Georgia

"Steve" arrived here in 1976 with the smattering of English he learned in the refugee camp. By 1978 he had fallen in love with and married an American girl, in spite of warnings of disaster from some in her family. The language barrier and culture shock have not kept him from learning to drive and working hard to provide for his family of four. Although he speaks with an accent, his vocabulary is growing. He became a U. S. citizen in 1986. Perhaps someday he'll be able to bring his aged mother to this country. I am proud of my brother-in-law and honored that he asked me to give him his American name.

DAN COX
Smithville, Texas

Afrikaners

You are to be congratulated on your choice of this complex topic. You could not have found a better artist of the written word than André Brink, one of the few sons of Africa with a broad worldly vision. Consideration could be given to covering

our largest ethnic group—the Zulus. The tourist motto "The world in one country" is apt.

HANS KUHN
Pretoria, South Africa

As one of this small and troubled nation of whom you write, I would ask: Why this article? Why by A. P. Brink, whom many of us consider a renegade? You have your Declaration of Independence and Constitution, your perceptions of democracy and human rights. You could be wrong, but we will grant you them. Will you not, therefore, extend the courtesy and allow us our silly truths and naive faith? We are locked in an internal struggle with a government many of us hold to be traitors and panderers of international acceptance. We have always been a divided nation. Perhaps we should never have existed as a nation. Please leave us to find out for ourselves.

J. S. GREEF
Nelspruit, South Africa

The term "terrorist" (page 584) signals a bias toward Pretoria's definition of its anti-apartheid opposition. Insurgents infiltrating into South Africa from frontline states are nearly all members of the African National Congress, whose leadership has barred indiscriminate targeting of civilians. True, civilians have died as a result of guerrilla attacks. But thousands more have perished at the hands of government security forces.

STEPHEN M. DAVIS
Washington, D. C.

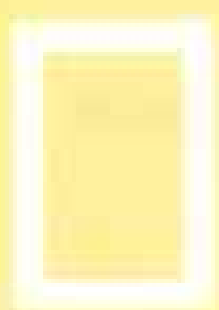
Dr. Davis wrote Apartheid's Rebels: Inside South Africa's Hidden War, Yale University Press, 1987.

Geographica

Thank you for the update on Robin Lee Graham in your new feature, Geographica. As a veteran special-education teacher, I relished the accounts of his lone voyage and found that a complete curriculum could be developed from his three articles. We read about sailing ships, wind currents, and ocean travel, practiced math by figuring distances covered and food and supplies needed, and wrote news reports about his adventures. Students related to Robin because of his youth. He inspired some special students to stretch and grow and to enjoy the challenge.

ALICE PERSYN
Clay Center, Kansas

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Letters should be addressed to Members Forum, National Geographic Magazine, Box 37448, Washington, D. C. 20013, and should include sender's address and telephone number. Not all letters can be used. Those that are will often be edited and excerpted.



Restoring Memorial on Corregidor

Spurred by an article in *NATIONAL GEOGRAPHIC*, the United States government has moved to repair the Pacific War Memorial and Museum on Corregidor, and there are plans to have an American government agency restore, maintain, and operate historical sites on the island fortress in the Philippines.

Writing in the July 1986 *GEOGRAPHIC*, William Graves noted that neglect and vandalism had created a "vast untended jungle" on Corregidor, where Americans and Filipinos fought in a valiant but vain attempt to resist Japanese assault early in World War II. Even the U.S. government's own Pacific War Memorial was in disrepair, Graves wrote.

After the article appeared, the Disabled American Veterans committed \$100,000 to a restoration project, and U.S. Navy Seabees spent two months cleaning the memorial's marble wall panels, replacing walkways, and making repairs to the museum.

Following a visit headed by Congressman G.V. (Sonny) Montgomery, chairman of the Committee on Veterans' Affairs, Congress voted to place historical and memorial sites on the island under the American Battle Monuments Commission; the bill authorized six million dollars to be spent on restoration and maintenance, pending an agreement between the U.S. and the Philippines. The Philippine government has indicated its support, but no formal agreement has yet been reached.

Watching Lemurs Eat: Southpaw Tendencies?

Lemurs, the primates whose fight for survival in their native habitat of Madagascar may be taking a turn for the better (*NATIONAL GEOGRAPHIC*, August 1988), have some lessons for us in this country too.

A study of 33 black lemurs, most of which live at the Duke University Primate Center in Durham, North Carolina, revealed that when they reached for food, 20 consistently did so with their left hand, while only 12 used their right hand. A lone lemur showed no preference for either hand.

Chris Forsythe and Jeannette P.



MELVYN CALDERON

Ward of Memphis State University conducted the study as part of an ongoing research project supported by the National Science Foundation. Forsythe says that their research helps disprove a notion that hand preference, a form of lateralization, is something peculiar to human beings. Instead, he says, since even such primitive primates as lemurs demonstrate a preference for using one hand instead of the other, lateralization may have evolved long ago in ancestors of humans.

It is possible, though, that left-handedness among lemurs is merely a sign of youth. The five oldest lemurs in the study were right-handed.



FRANK LAYTON

Cuneiform Tablet Links Sumerians, Supernova

The 1987 discovery of a supernova—an exploding star—that could be seen by the naked eye set off cheers in the world of astronomy, and for good reason: The last supernova that was easily visible had appeared 383 years earlier (*GEOGRAPHIC*, May 1988).

George Michanowsky, a scholar who specializes in ancient Sumerian culture, believes that Sumerians too witnessed such a rare event in those pretelescope days. He says that two lines of cuneiform writing on a tablet he found in the British Museum refer to the sighting of an exploding star in the constellation modern astronomers call Vela. This event, later described in the tablet, occurred about 4000 B.C.

Sure enough, astronomers have discovered evidence of a pulsar in Vela, indicating that a spectacular stellar explosion would have been visible about that time.

Black History Trail for Nation's Capital

What started as an Eagle Scout project for a Temple Hills, Maryland, youth a decade ago has turned into the first national recreation trail devoted to black history.

The Washington, D.C., Black History National Recreation Trail was dedicated last February during Black History Month. It was the successful

end to the effort of Willard André Hutt, who was 17 when he first began working on the project. The trail includes what the National Park Service calls "magnet sites" that illustrate black history from slavery through the New Deal. Among them are black cemeteries that date from the early 19th century, the first African Methodist Episcopal church in Washington, and the homes of black educator and political activist Mary McLeod Bethune and abolitionist leader and writer Frederick Douglass.

Hutt (below), seen in the Douglass home, chose the sites and spent years working with local and national officials to get the trail approved. He now is a salesman in Minneapolis.

Today there are nearly 800 national recreation trails established under a 1968 law that authorized the National Trails System.



CHUCK TAMMARA

Aid for Computer-based Geographic Research

Academic geographers have turned to computers to help them do their jobs better and in new and different ways. But the use of computers to improve the understanding of geographic data is far from perfect. So the National Science Foundation has awarded a five-year, \$5.5-million-dollar grant to a consortium of three universities to create a National Center for Geographic Information and Analysis.

The consortium—whose members are the University of California at Santa Barbara, the University of Maine at Orono, and the State University of New York at Buffalo—will carry out research aimed at making better use of the mountains of data accumulated in geographic information systems (GIS) by geographers and by society in

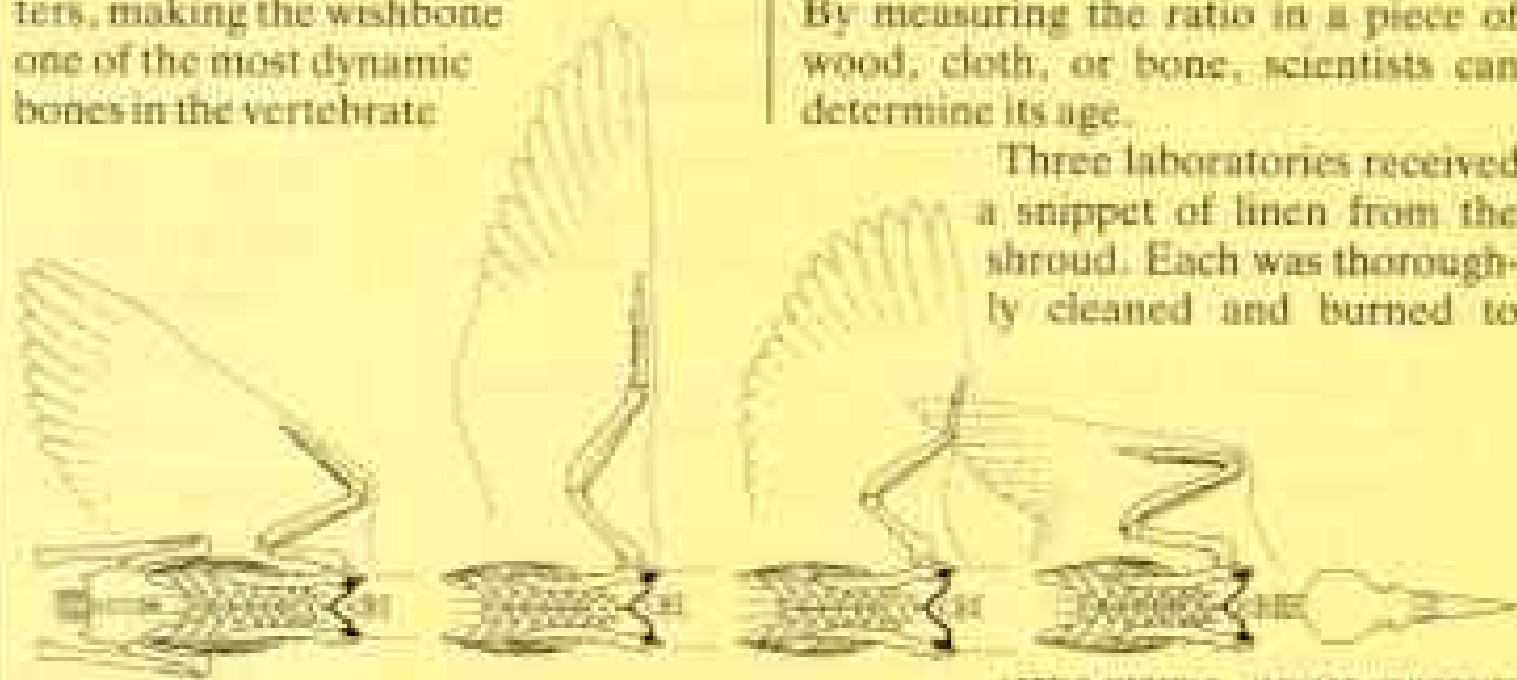
general. For example, the center will develop programs for many applications, such as aiding population evacuation in a disaster; using electronic maps to show changes as time passes; and giving geographers better access to the ever growing, ever changing information stored in a GIS.

The center will also deal with the problem of creating errors while using computers to produce maps. As one geographer noted in a letter to an official of the National Science Foundation, "We can now produce rubbish faster and with more elegance than ever before."

Wishbone in Action: A Real Flexible Flier

Anyone who has ever tried to pull apart a wishbone knows that it is flexible. X-ray movies of starlings in flight in a wind tunnel show, however, that a wishbone is far more flexible than we have imagined.

"We thought that the wishbone might be a strut to stabilize the bird's shoulder while the wings beat," says Farish A. Jenkins, Jr., of Harvard University, one member of the team that revealed the skeleton of a bird in flight for the first time. "What we discovered instead was that on the wings' downstroke, this V-shaped bone is bent out, and on the upstroke, like a spring, it recoils to its original position." The amount of movement is "extraordinary," says Jenkins. The ends of the wishbone are about 12 millimeters apart when a wingbeat begins (diagram, below) but separate to as much as 18 to 20 millimeters, making the wishbone one of the most dynamic bones in the vertebrate

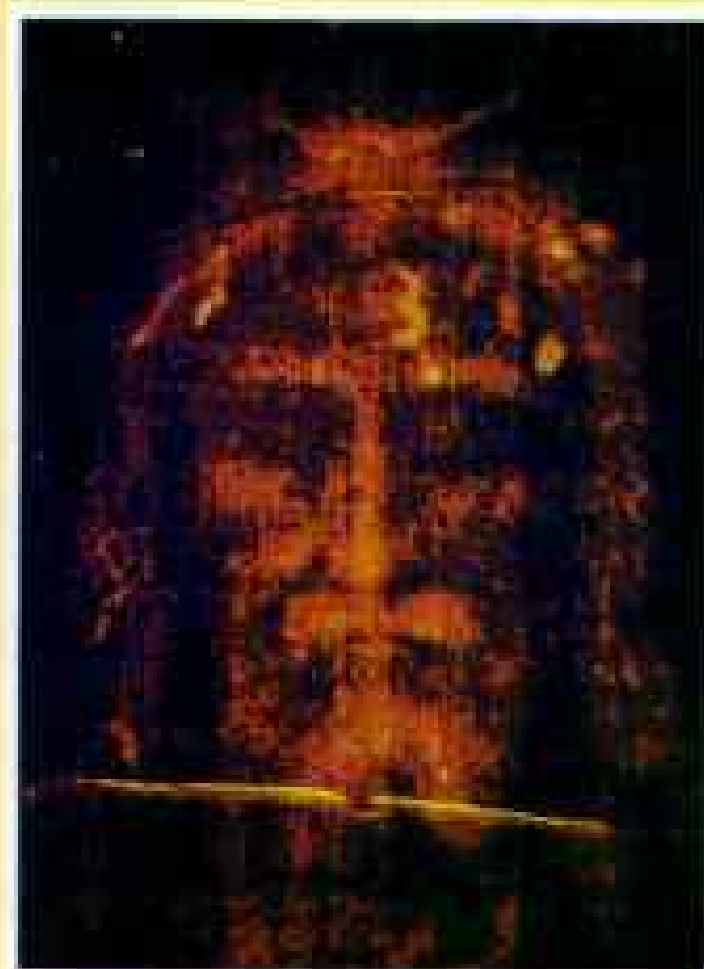


LATELLO MULLIGAN, HARVARD UNIVERSITY

world. And it must be strong enough to take a lot of bending. Typically a starling flaps its wings 12 to 16 times a second during flight.

Jenkins speculates that the wishbone's unusual flexibility helps the bird to breathe in flight. Its movement forces air in and out of the air sacs located between the bone's two shafts.

Joining Jenkins in the study were Kenneth P. Dial of the University of Montana and G. E. Goslow, Jr., of Northern Arizona University.



SEE PHOTOGRAPHER VICTOR H. BOYD, JR.

Using Science to Date an Icon of Faith

An improved method of radiocarbon dating was the key to the discovery that the Shroud of Turin (GEOGRAPHIC, June 1980) dates from medieval times and could not be Christ's burial cloth. The new method is faster and requires smaller samples of material than older techniques.

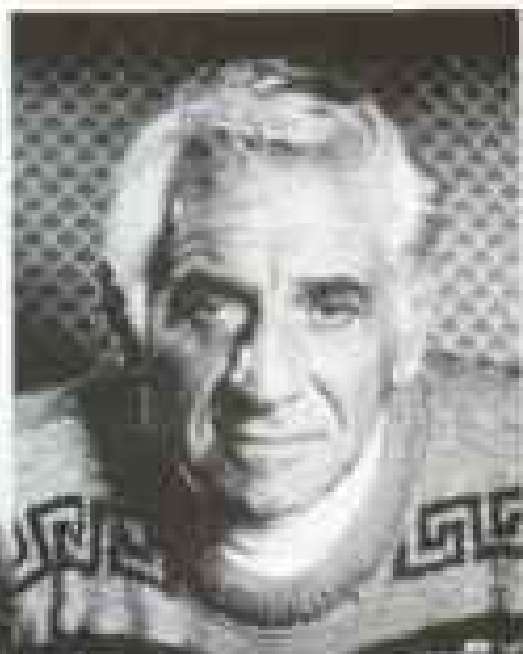
Carbon dating relies on the fact that carbon dioxide in the atmosphere contains stable carbon 12 and carbon 13 and a small amount of radioactive carbon 14. All living things continually absorb carbon dioxide, and the ratio of the carbons remains in balance until death. Then radioactive decay reduces the ratio of C¹⁴ to C¹² at a known rate. Half the C¹⁴ disappears in 5,730 years. By measuring the ratio in a piece of wood, cloth, or bone, scientists can determine its age.

Three laboratories received a snippet of linen from the shroud. Each was thoroughly cleaned and burned to

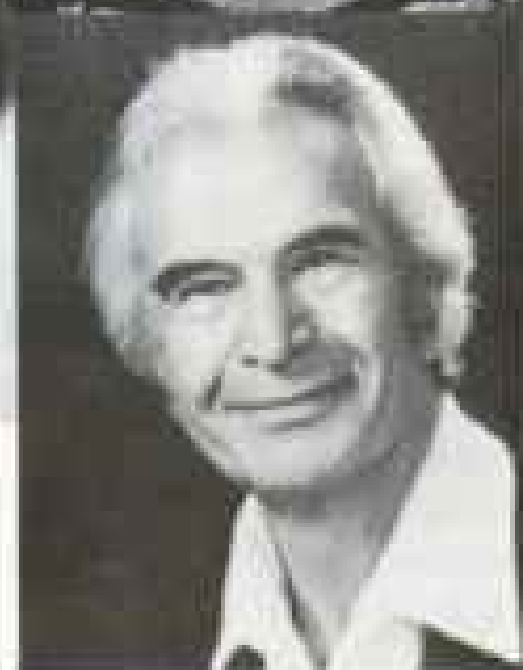
produce carbon dioxide and then pure carbon, whose atoms were electrified. A high-energy mass spectrometer separated the carbon isotopes and counted their atoms. From their ratio came the fabric's age: The 14-foot linen strip was woven from flax harvested in the late 13th or early 14th century.

Scientists have found no evidence of paint, dye, or ink on the shroud. How did it get its faint, realistic image of a crucified man? That mystery radiocarbon dating cannot solve.

Leonard
Bernstein



Liza Minnelli



Dave Brubeck

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MOST OF US recall fondly a favorite teacher who shaped our lives. Mine was Cliff Edom, my photojournalism professor at the University of Missouri. Usually the student-teacher relationship is brief. Ours spans three and a half decades. Since 1952 I've attended Cliff's Missouri Photo Workshop 25 times as student and teacher.

Slow learner? Maybe. But the real reason for repeating the experience: Cliff's brilliant workshop concept that enriches the teacher as much as the student. Spawned 40 years ago by the brusque, demanding professor and run until 1986 with the help of his charming sidekick and wife, Vi, the workshop blends boot-camp toughness with sensitive reinforcement of high ethics and higher expectations. It gives direction to young minds and provides intellectual Geritol for old or cynical minds.

Each year students—mostly young journalists—gather in a different small Missouri town to photograph a "week in the life" of the town under the supervision of a faculty of editors and photographers. Students choose, research, photograph, and edit their individual assignments. The staff alternately intimidates, teaches, and inspires through one-on-one sessions and an every evening bare-knuckle critique of each student's work in front of the assembled group—a gantlet few students escape unscathed.

More important, few leave these retreats into small-town Missouri—where old-fashioned values are not old hat—without a deeper understanding of themselves. Whatever the lessons learned, a *Family of Man* type of photodocumentary of each town evolves. We draw upon this unique archive as we look at life in Small-Town America—a charming contrast to the impersonal world of skyscraper living.

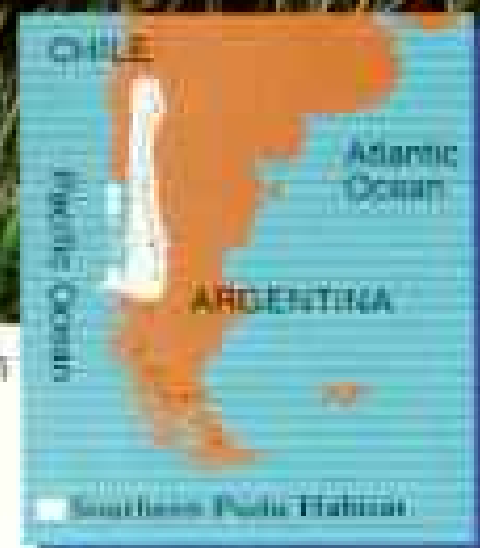
Like many good ideas, Cliff's grew out of a perceived need. "I wanted to learn from all the greats of photojournalism," Cliff told me. "Since I couldn't afford to go to them, I brought them to Missouri to teach." Little did the modest, home-spun teacher realize that to the profession and particularly to his 2,000 workshop graduates he would become one of the greats himself.

Wilbur E. Garrett

EDITOR



Southern Pudu Genus: *Pudu* Species: *pudu* Adult size: Shoulder height, approx. 38cm
Adult weight: Less than 12kg Habitat: Temperate rain forests in the lower Andes
in Chile and Argentina Surviving number: Unknown
Photographed by Gunter Ziesler



Wildlife as Canon sees it

One of the greatest roles of photography is to record and preserve images of the world around us worthy to be handed down as a heritage for all generations. A photograph captures the meek and docile nature of the southern pudu, the world's smallest deer, standing barely 15 inches tall.

Over the last few centuries, 90 percent of the pudu's woodland habitat has been cleared for human settlement, exposing the diminutive deer to pressure from increasing contact with people and livestock. This loss of habitat, along with predation by feral dogs, hunting and the pet trade, has endangered the pudu. Additional research to

learn how man and the pudu can coexist, and captive breeding programs that will someday replenish wild populations, are both needed if this rare Andean dwarf deer is to survive.

As with most endangered species, the future of the pudu greatly depends on mankind's ability to live in harmony with the natural world. An invaluable research tool, photography can help promote a better awareness and understanding of the pudu and how it lives within its natural environment.

And understanding is perhaps the single most important factor in saving the southern pudu and all of wildlife.

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On Assignment



PHOTOGRAPH BY CHARLIE LITMAN

“THE WORLD seems so clear and simple from above,” says free-lance photographer LYNN JOHNSON, here poised more than 700 feet above a Chicago street to shoot the John Hancock Center for her first NATIONAL GEOGRAPHIC assignment. “I was confounded by the monumental task of trying to understand the Hancock’s hundred stories and thousands of people.” Climbing aloft with the construction crew at 900 North Michigan Avenue, which now blocks the view of some Hancock residents, gave her a fresh perspective.

Working at great heights is nothing new to Lynn. She learned to walk a steel beam stories high while documenting the construction of PPG Industries headquarters, a personal project during her seven years at the *Pittsburgh Press*. In her free time she served as a mountain rescue volunteer in the Alleghenies. “Training for our squad was very rigorous,” Lynn recalls. “We even rappelled out of

helicopters. The tools such experiences gave me are as important as anything in my camera bag. All else is superfluous if you don’t have the confidence to take the first step, if you can’t control your own mind.”

It was a perfect match—that 1878 photograph by William Henry Jackson (below) and the view (bottom) that met Assistant Editor ROWE FINDLEY as he stood above two-mile-high Seneca Lake in Wyoming’s Wind River Range. The seams and cracks in the slickrock, foreground, were unmistakably the same, and there was the same small boulder on top. Rowe and photographer Jim Amos mounted a packtrain party to seek Jackson’s site. Once found, “It

was as if we could see the imprints of his tripod!” Rowe said. But more than a century’s growth of conifers forced them forward for a view of the lake. Following Jackson’s many trails across the American West led to new source materials on the pioneer photographer. Fittingly, the Jackson article appears on the sesquicentennial of photography; the first daguerreotypes were shown in 1839.

The West is Rowe’s favorite beat: “Its history, far distances, and ever changing lights excite me.” During 30 years with the magazine, he has explored canyonlands and national forests, Death Valley and life in desert potholes, and shared in the human tragedies of the Mount St. Helens eruption.

JAMES L. AMOS (BOTTOM); U. S. GEOLOGICAL SURVEY PHOTO LIBRARY

