

VOLUME CXII

NUMBER FOUR

THE NATIONAL GEOGRAPHIC MAGAZINE

OCTOBER, 1957

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Dr. Zahl's warm, human, and brilliantly illustrated articles are eloquent of their author's extraordinary range of interest and knowledge. His subjects have ranged from the Gulf Stream to the tides of Fundy, from the "wilds" of his pet-filled city parlor to Olympic National Park, and from the scarlet ibis of Venezuela to the honey-eating lorikeet of Australia.

Versatile Dr. Zahl has just made for The Magazine a color record of dwarf sea horses in Florida waters. Now, with a National Geographic grant, he is off to the Amazon in quest of giant ants.

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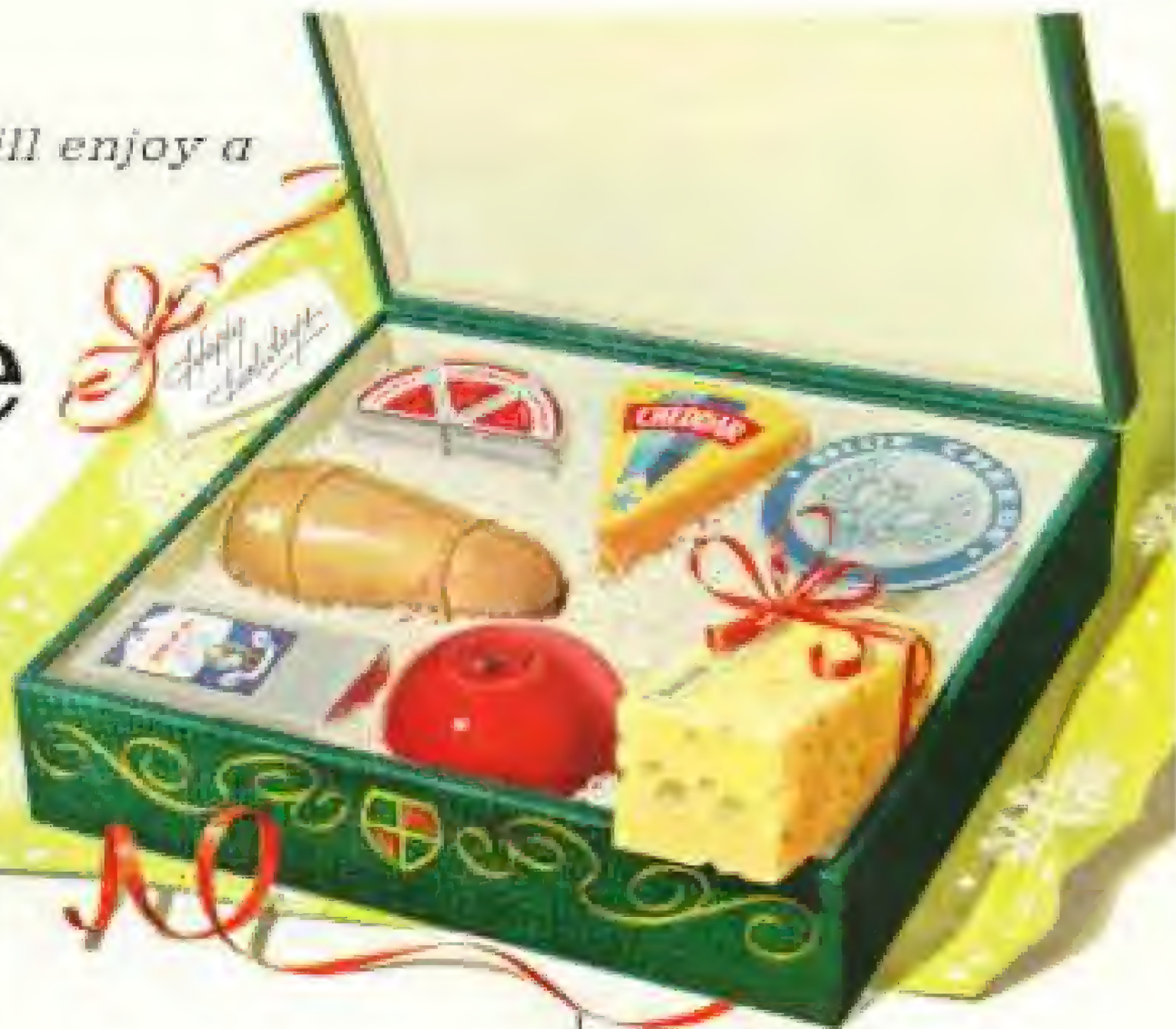


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PROVOLONE

Smoky, masculine and of Italian origin, Provolone is light in color and firm. Provolone bears distinctive "rope" marks from the sling in which it is suspended while aging. Serve it in finger slices with beverages, holiday turkey plates. Good with fruit, too.



BLUE

Blue comes from a famous cheese family dating back to 1070. Blue is a semi-soft, crumbly white cheese veined throughout with blue mold. Its flavor

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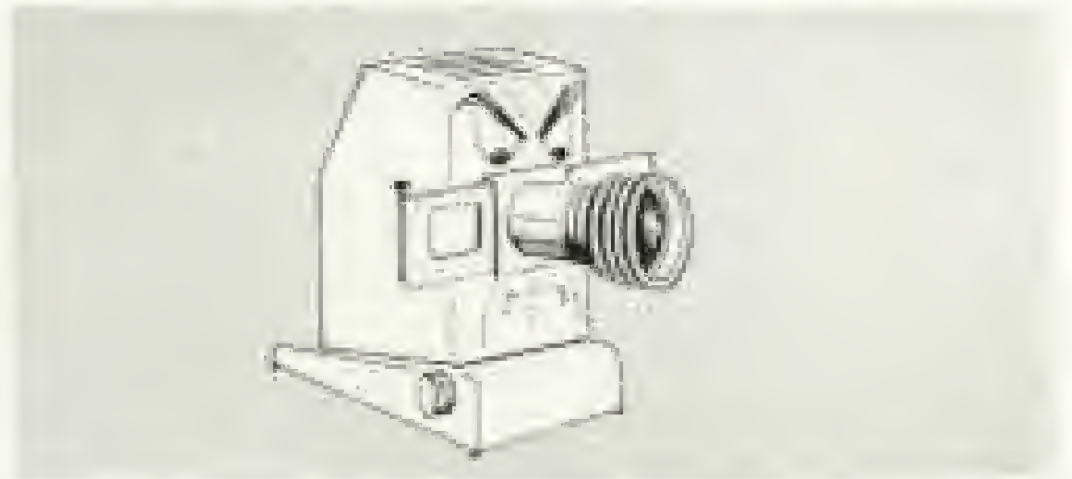
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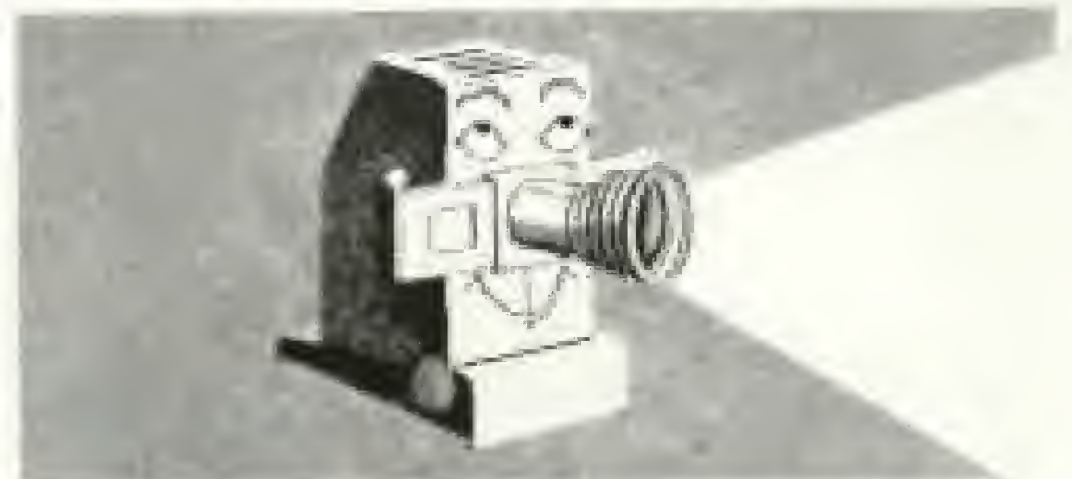
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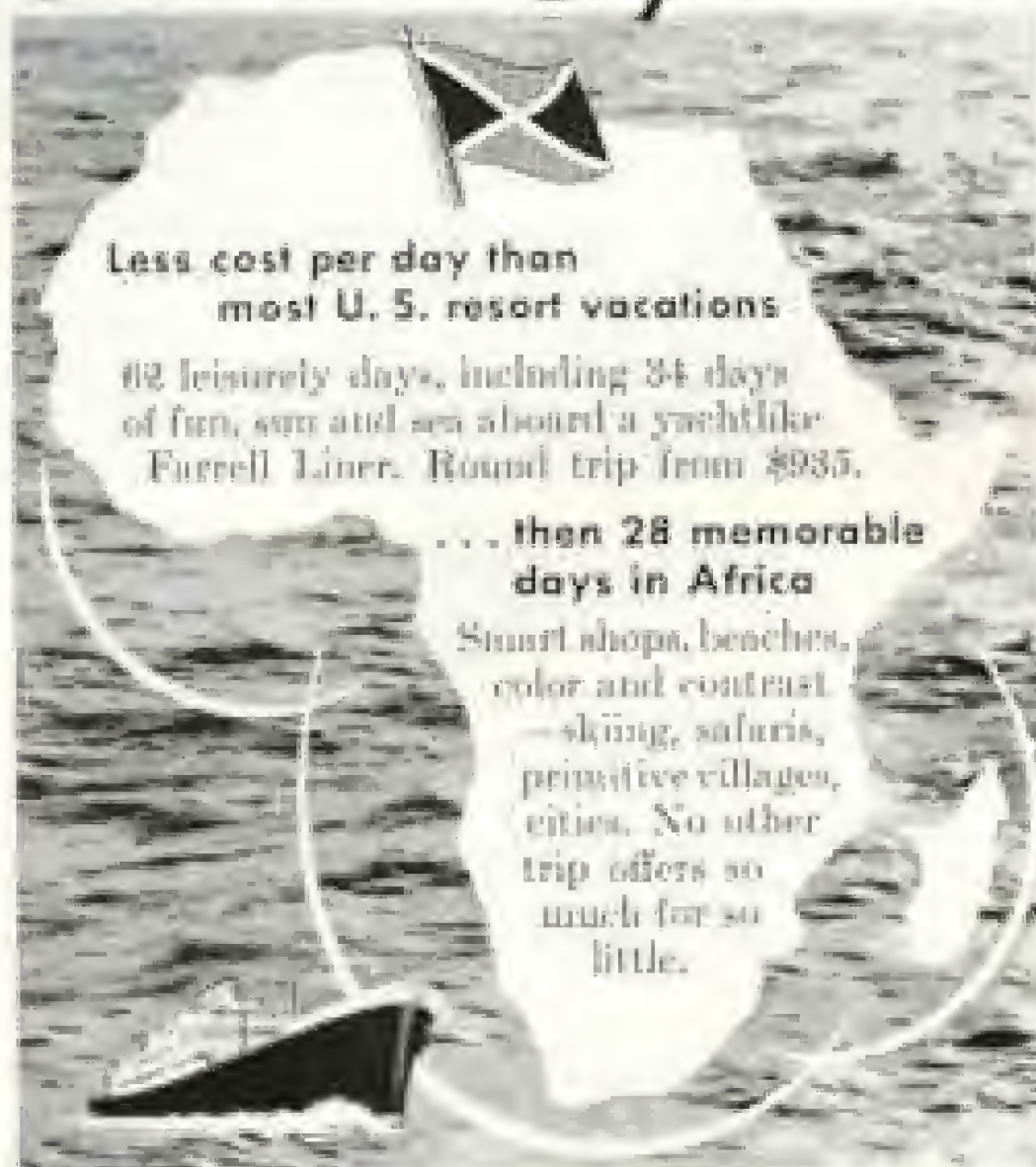
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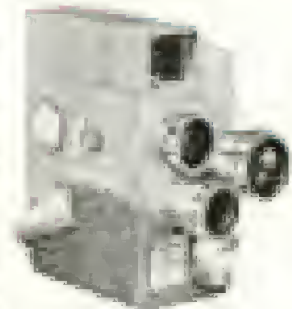
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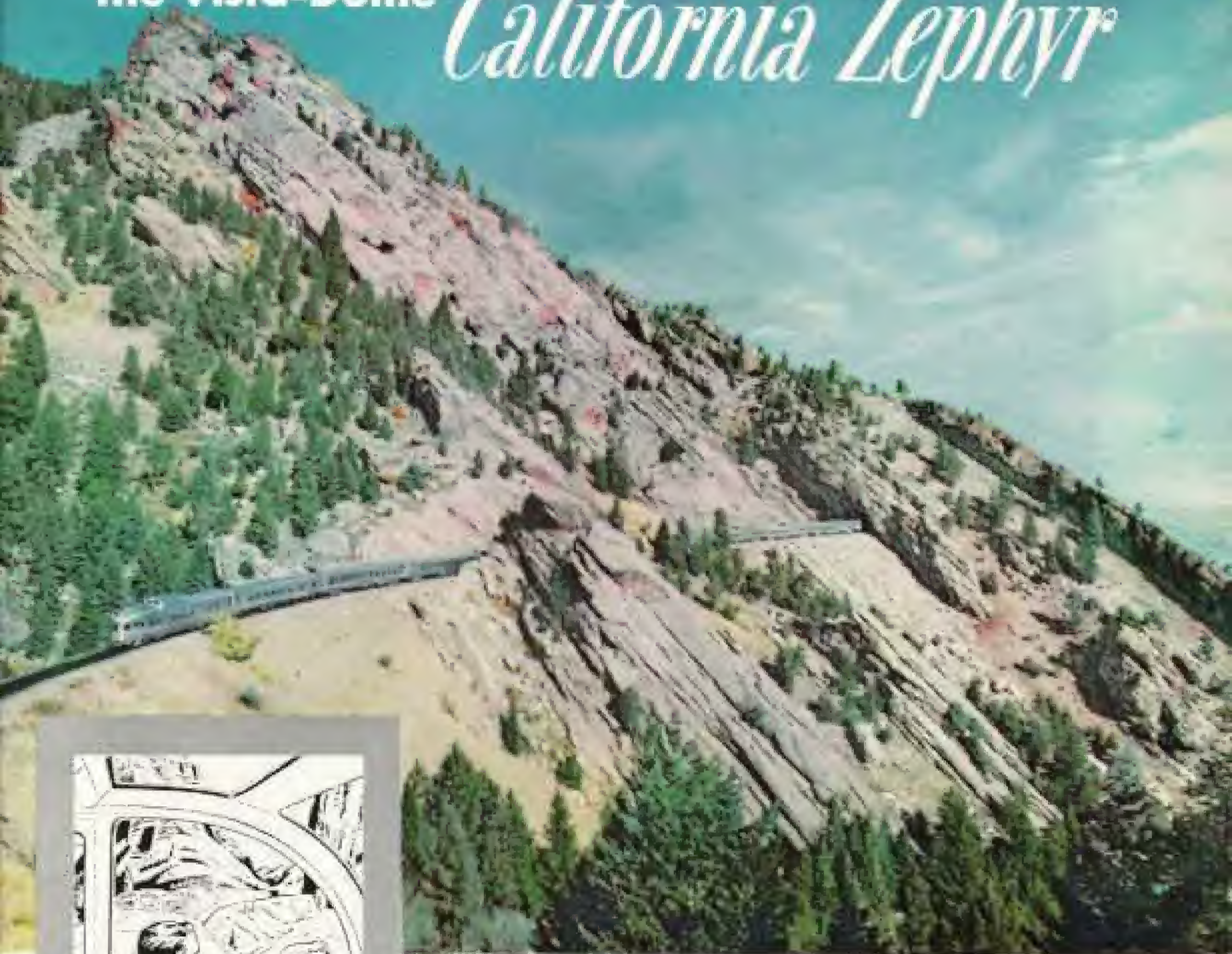
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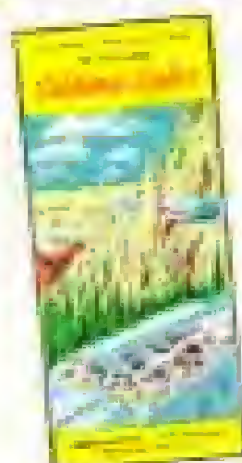
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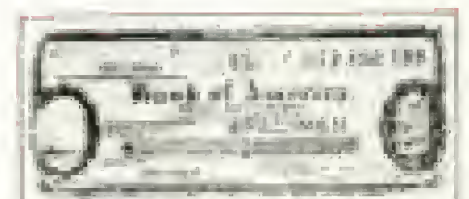


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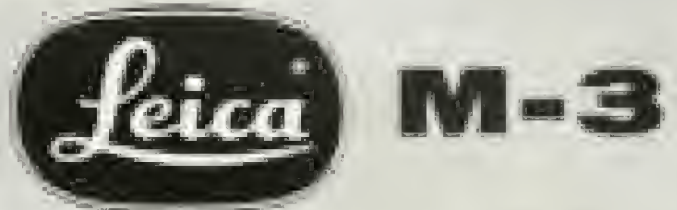
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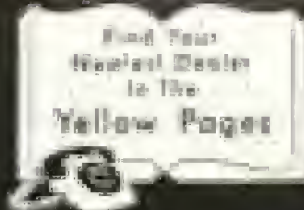
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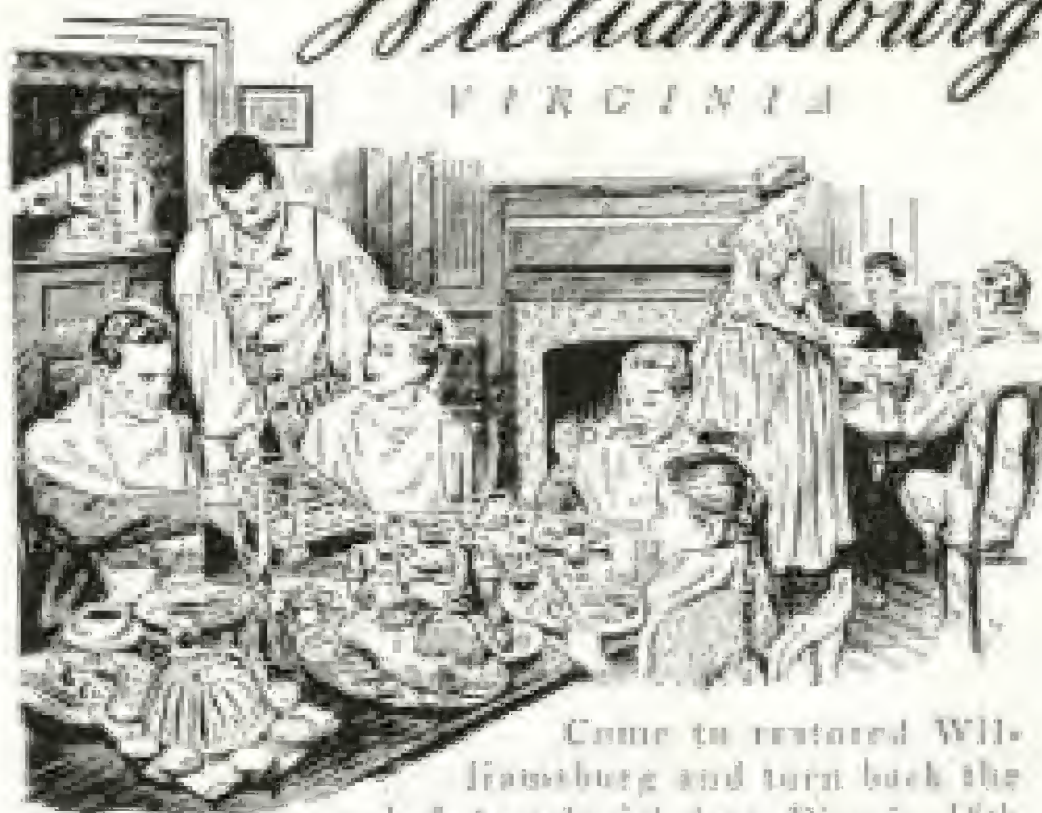
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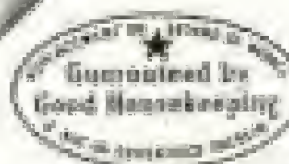
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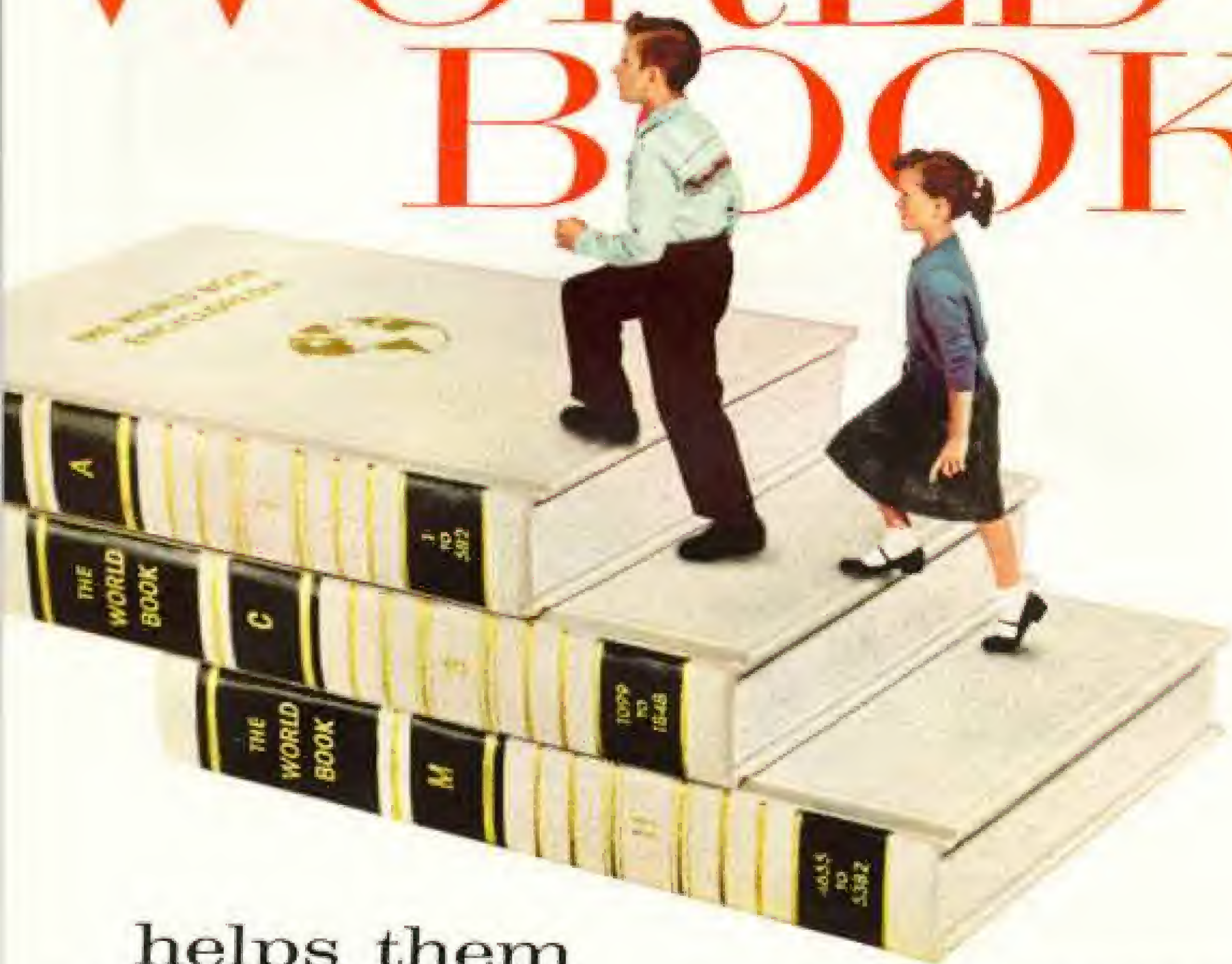
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Can you always believe your eyes?

When watching feats of magic, you're almost inclined to believe what your eyes *seem* to see. In another and far more important way, you can be misled by your eyes . . . and not know it.

For example, some eye disorders develop so slowly that they are often not noticed in the beginning. In fact, the eyes may seem perfectly all right at the very time they are misleading you.

So, the best safeguard you can take against eye trouble that you may not suspect is to have your eyes—and those of each member of your family—examined periodically by specialists.

It is particularly wise to have a child's eyes checked early in the pre-school years, before eye disorders can seriously hamper personality development or interfere with educational progress when he starts to school.

Today, authorities estimate that about 9 million school children need some form of eye care.

Adults, especially after age 40, should have their eyes examined at least every two years by an eye specialist. This

is the surest way to guard against glaucoma and cataract, the two major threats to the sight of older people.

These eye examinations have an added value. They may lead to early diagnosis and control of diabetes, high blood pressure and hardening of the arteries.

Treatment for many eye diseases has been vastly improved recently. The antibiotic drugs work wonders in many eye infections, and hormone compounds save sight in some eyes which would be doomed without them.

Moreover, glaucoma-blindness can be avoided in most cases when diagnosed early and treated properly. Sight lost due to cataracts can be restored by surgery in almost 90 percent of the cases.

Delicate surgical operations may also restore vision in some cases where the retina has become detached. It is possible, too, to restore vision in certain kinds of cases, by transplanting the cornea from good to diseased eyes.

Medical progress in sight-saving is a great achievement. However, good sight throughout life depends largely on what you do to give your eyes the regular care they deserve.

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Poets' Voices Linger in Scottish Shrines

Tam o' Shanter, Macbeth, Rob Roy, and the Lady of the Lake
Still Haunt the Lochs and Braes of Bonnie Scotland

BY ISOBEL WYLIE HUTCHISON

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With Illustrations by National Geographic Photographer Kathleen Revis

ONE evening in Edinburgh, Scotland, 143 years ago, a party of young lawyers sat over their after-dinner wine. Their eyes kept turning to a window in an adjacent building where a writing hand moved ceaselessly across sheet after sheet of paper. At last the host could bear the sight no longer and changed his place.

"Since we sat down," said he, "I have been watching it. It fascinates my eye. It never stops. Page after page is finished and thrown on that heap of manuscript and still it goes on unwearied. And so it will be till candles are brought in, and God knows how long after that. It is the same every night."

"Some stupid, dogged clerk, probably," someone suggested.

"No, boys," said the host. "I well know whose hand it is. 'Tis Walter Scott's."

Romance Finished in Three Weeks

In the evenings of three summer weeks this hand wrote the two last volumes of *Waverley*, the novel that electrified all of Britain with its romantic tale of Highland chiefs, a dashing English renegade, and the lost cause of Bonnie Prince Charlie.

And this hand, when financial disaster struck its owner, put forth a heroic creative effort. For the last six years of his life Scott wrote day and night to clear a debt of £130,000—equivalent in present-day purchasing power to nearly three million dollars.

The hand of Walter Scott is a good one to take in setting forth on a summer tour of some of Scotland's literary shrines. If the weather is tempestuous and unpredictable, the succession of storm and sunshine only reflects the character of Scottish literature and the varied temperaments of its creators.

Journey Starts at Royal Mile

Last year, in the company of Miss Kathleen Revis, National Geographic photographer, I started my journey at that unique treasury of Scottish literary landmarks, Edinburgh's Royal Mile. The historic hilltop street, linking Edinburgh Castle on its 445-foot crag to the Palace of Holyroodhouse, descends through Scott's "own romantic town,"

Whose ridgy back heaves to the sky,
Piled deep and massy, close and high.

West to east, the Royal Mile falls into four sections: Castle Hill, Lawnmarket, High Street, and Canongate (map, page 442). With it have been associated most of Scotland's great writers, from Allan Ramsay on Castle Hill to Tobias Smollett in Canongate. Here walked Robert Burns, Sir Walter Scott, James Boswell, Adam Smith, David Hume, Thomas Carlyle, Robert Louis Stevenson, J. M. Barrie, and Conan Doyle.

The Royal Mile is bordered by tall multiple-dwelling houses, called "lands." Once the abode of aristocracy, the lands fell into decay



"What a Romance in Architecture!" Cried Sir Walter Scott of His Beloved Abbotsford

Scotland's famed novelist built the home of his dreams in installments during a decade of writing. As lord of the baronial mansion, amid soaring turrets and medieval treasures, Scott played host to the world. To him the estate often seemed as public as a fair; Lady Scott called it the "hotel without de pay." When Scott's publishers went bankrupt and the writer set out to repay their debts, he sadly saw lovely Abbotsford as his "Delilah."



Braw Lad of Galashiels and His Escorts Pay Tribute to the "Wizard of the North"

Each year the burgh of Galashiels commemorates the granting of a 17th-century charter to hold a midsummer fair. Led by a Braw Lad and Lass, horsemen patrol the town's borders and call at historic spots. Great-great-great-granddaughters of Sir Walter Scott welcome them to Abbotsford, most of which is open to the public. Rhododendrons flame before a wing of the mansion erected after the writer's death. Scott built the gate and towers beyond.

in the 18th century when Edinburgh's New Town sprang up across the valley.

But today the Mile is again coming into its own. With many of its structures restored and refurbished, it is regaining past dignity and is once more a focus of civic pride.

I introduced Miss Revis to the Royal Mile on a blustery May morning. Rollicking gusts of wind tugged at our coats as we set forth from Castle Hill.

To the skirl of bagpipes and the roll of drums, we watched two boys' bands march out of the parade ground of Edinburgh Castle. Kilts swinging, they turned into one of the narrow streets of the Old Town. We stood rooted while their high-pitched music swelled, blared past, and faded in the distance.

Here on Castle Hill had lived Allan Ramsay (page 460), poet, wigmaker, and bookseller, who about 1725 set up the first circulating library in the city. His attempt to liven the citizens with plays and other works of fiction so alarmed the magistrates that they tried—ineffectually—to suppress his work.

Jekyll and Hyde Haunt Brodie's Close

The West Bow divides Castle Hill from the Lawnmarket, the old "land" market where agricultural produce was sold. Up this street, in *Catriona*, galloped Stevenson's hero, David Balfour, as real as any rider of flesh and blood, and "drew up a smoking horse at My Lord Advocate's door."

Opposite the Bow, Miss Revis and I looked into James's Court, which once housed James Boswell, the world's most famous biographer. Boswell and Dr. Samuel Johnson came swaggering down "the croon o' the causeway" one August evening, keeping well out in the street. It was suppertime, and the cry of "gardy-loo!" (*garde l'eau*: "watch out for the water!") was apt barely to precede the emptying of slop pails from upper windows!

Farther along the Lawnmarket we found Brodie's Close, of sinister memory. Here lived the contradictory being whose double life suggested the story of Dr. Jekyll and Mr. Hyde. For carpenter Deacon Brodie in his spare time was a burglar, Stevenson wrote, "...slinking from a magistrate's supper-room to a thieves' ken [den], and pickeering among the closes [skulking in the passageways] by the flicker of a dark lamp."

Brodie ended his career upon the gallows in 1788, but he lives on in the inspired pages of "R.L.S.," whose Edinburgh nursery held

a bookcase and chest of drawers made by the notorious cabinetmaker.

As we imagined Brodie slaking down the Royal Mile arm in arm with Hyde, we fancied a tall, thin figure shadowing him: fiction's greatest detective, Sherlock Holmes. He too, like Hyde, sprang from the imagination and early life of an Edinburgh man.

Real-life Sherlock Fooled by Teeth

Holmes's creator, Conan Doyle, was a doctor who studied medicine under a famous Edinburgh professor, Joseph Bell. Dr. Bell's exceptional keenness of observation gave Doyle early inspiration for the great Sherlock, born in *A Study in Scarlet* in 1887.

But Dr. Bell was not quite as infallible as Holmes. One day he was lecturing to his students about a workman whose ill-health, declared the doctor, might be deduced from the bad state of his teeth. Hearing this, the patient obligingly remarked: "If ye want tae see them closer, doctor, I'll tak' them oot!"

Nearing the Lawnmarket's end, we turned into Baxter's Close. Here came Robert Burns from Ayrshire in November, 1786, glad to share room and bed with a friend at the modest rate of one shilling sixpence weekly.

Despairing of success as a poet, Burns had decided to emigrate to Jamaica. His traveling box was on its way to the wharf when he received a letter of praise written by the blind Edinburgh poet, Dr. Thomas Blacklock. With prophetic perception the sightless poet had written enthusiastically about Burns's poems, urging a second edition.

"This encouragement fired me so much," wrote Burns, "that away I posted to Edinburgh without a single acquaintance...."

(Continued on page 446)

"Gray Hills and . . . Wild Border Country" Have Beauties Peculiar to Themselves.

Scott Said of a Favorite View

Here the author often stood gazing across the land celebrated by his poems and novels. On the horizon rise the Eildon Hills, haunted by legend, "for weirdly deeds renowned, with ancient camp of Roman crowned."

Trees shade the winding course where Scott saw the "Twined's fair river, broad and deep."

Scott paid his last visit to the scene on his journey to the grave. One of the horses drawing his hearse stopped here, bringing the mile-long cortege to a halt. Historians speculate the horse may have been Scott's own, stopping out of long habit.

"The bonny bonny broom" of Border ballad sprays the roadside with gold.





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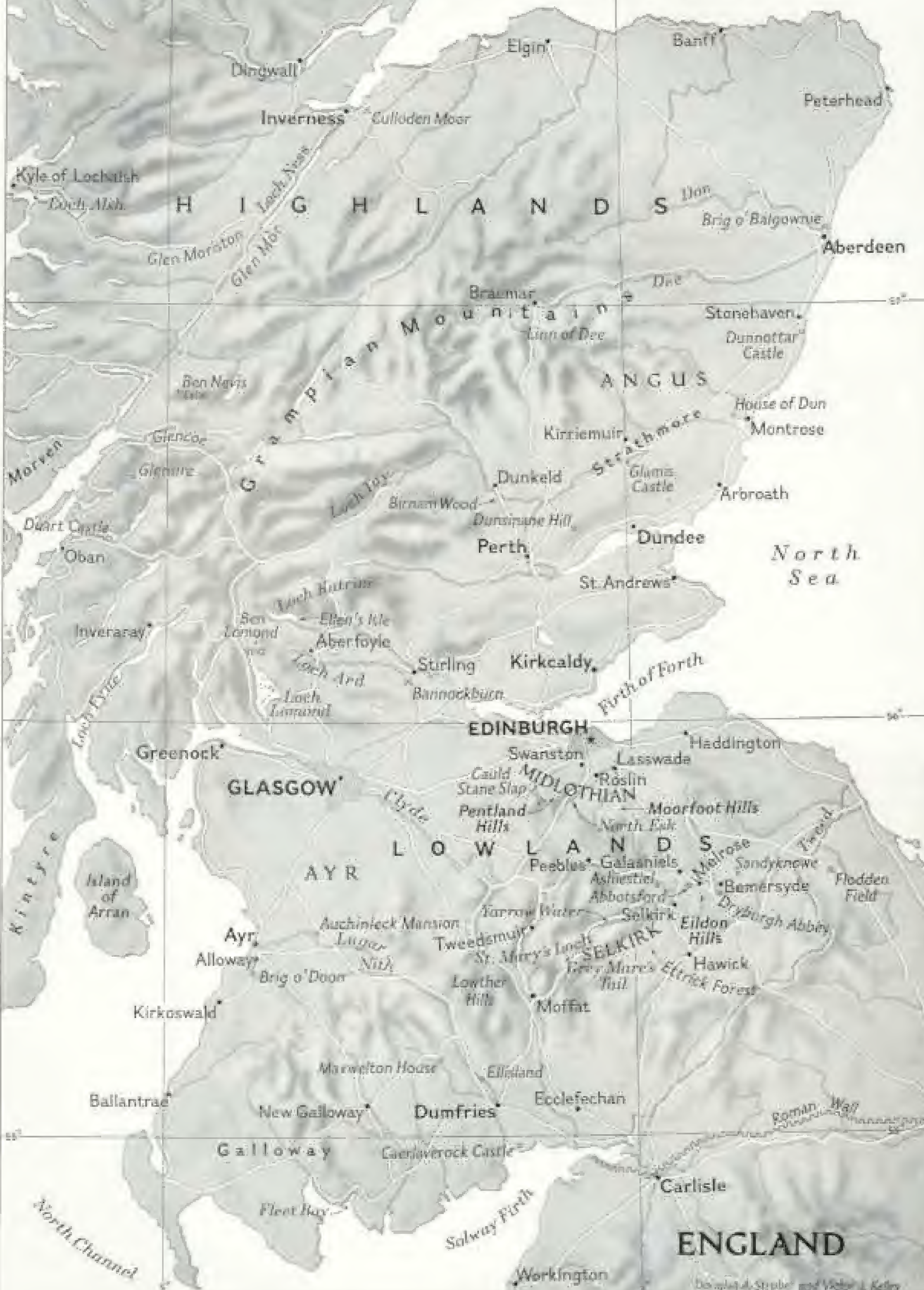
A Friendly Sheep Greets the Author in Haunts of Shepherd-poet James Hogg

Here, near St. Mary's Loch, Miss Hutchison viewed scenes of the poet's youth. "So fast my love for Ettrick grew, implanted in my very nature."

↓ Edinburgh calls Castle Hill, Lawnmarket, High Street, and Canongate the Royal Mile because they were the route of Scottish sovereigns. Distance from castle to palace is actually one mile, 106 yards.



Literary Landmarks of SCOTLAND







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*"I'm Thinkin' o' the Merry Days,
Afore I Trod Thae Weary Ways"*
Young Spirits Still Enliven the
House of Dun, a Poet's Home

Violet Jacob in *Songs of Angus* uses the Scottish vernacular to describe scenes from her youth. Like Stevenson, longing for "hills of home," Mrs. Jacob expressed the nostalgia of an exile.

Sister of the 19th Laird of Dun, Mrs. Jacob grew up in this house, which was designed by William Adam and built in 1730. "Adam houses," she wrote in her book, *The Lairds of Dun*, "suggest comfort and dignity in a dally life that has a rich human setting."

In *The Wild Geese* the poet begs the wind to tell what it saw in Scotland: "My man, I swept the Angus braes ye hae'na trod for years." Whereupon she cries, "O Wind, forgi'e a hameless loon that canna see for tears!"

← The House of Dun is now a hotel patronized by many sportsmen. The proprietor, Thomas Hamilton (right), sits with family and guests in the drawing room.

Allegorical figures in plaster decorate walls and ceiling.

Above: Alison Rae, a Hamilton granddaughter, executes the Sword Dance over crossed saber and scabbard.

→ "Up wi' the chanter, lad, an' gie's a blaw!" Mrs. Jacob's words suit the action as Mr. Hamilton plays the bagpipes for Eloise Rae's Highland fling. He wears dress Hamilton tartan; she, hunting Macrae.





*"If Thou Wouldst View
Fair Melrose..."*

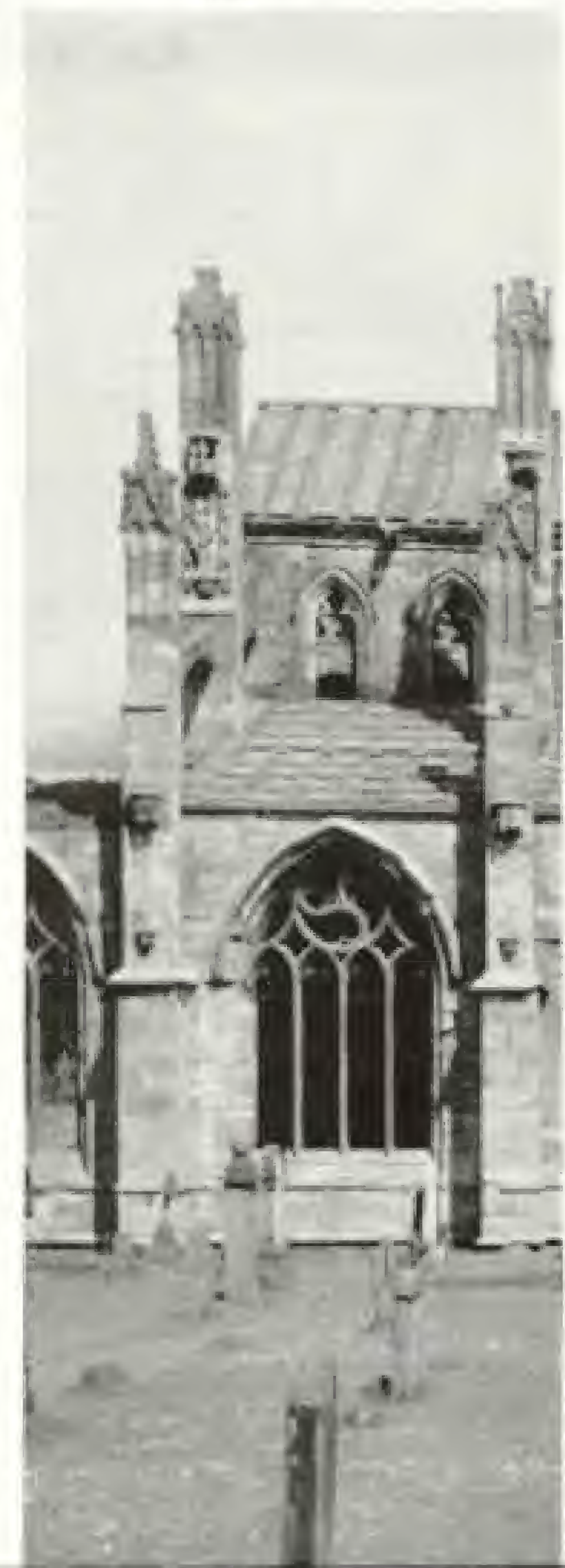
In Scott's *The Lay of the Last Minstrel*, the Lady of Branksome sent a knight to Melrose Abbey to win from the tomb of wizard Michael Scott the ironbound Book of Might, a treasury of secrets on sorcery. On the fate of that mission the writer stitches the romantic tale of Scottish Border men—their wars against the Southerners, their chivalry, courtship, and lance-to-buckler combat.

← Photographer Kathleen Revis sheds shoes and mounts a post to focus on the abbey.

↓ "Was never scene so sad and fair!..." "Go visit it by the pale moonlight," Scott recommended, "when the broken arches are black in night."

Walter Mears, Edinburgh,
National Geographic Staff (left)

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Scott was only 15 when Burns came to Edinburgh. The two met but once, at the house of a friend. The boy was able to name the author of an obscure quotation that had moved Burns to tears; the poet rewarded him "with a look and a word," to Scott's intense gratification (pages 478-9).

"I would have given the world to know him," Scott wrote later. "His person was strong and robust... a sort of dignified plainness and simplicity. There was a strong expression of sense and shrewdness in all his lineaments; the eye alone, I think, indicated the poetical... temperament. It was large and of a dark cast, and glowed... when he spoke with feeling or interest. I never saw such another eye in a human head."

This was the sympathetic but satirical eye that once spied a mouse crawling upon a lady's bonnet. The result was the immortal:

O wad some Power the giftie gie us,
To see oursels as ithers see us!
It wad frae mony a blunder free us,
An' foolish notion...

Heart of Stone Marks Prison Portal

Edinburgh's prison, the Old Tolbooth, once stood near Burns's lodging. All that remains of it today is a heart shaped in paving stones, where the prison door once stood. As Miss Revis and I gazed upon this grim symbol, we thought of Scott's *The Heart of Midlothian*. For in this, possibly his greatest novel, the Tolbooth

casts its shadow across the tragic love story of a Scottish lass and her outlaw lover.

Next to the prison site looms St. Giles' Cathedral. Entering, we sought the Side Chapel, where a fine bronze relief shows Robert Louis Stevenson seated on a couch, pen in hand. From the cathedral's pulpit the stern Calvinist John Knox—himself a renowned religious historian and a reviser of the Book of Common Prayer—denounced Mary Queen of Scots, a devout Roman Catholic, as a "plague to this realm."

Cleric Unawed by "Pleasing Face"

Once, as Knox left a royal audience with a "reasonable merry countenance," a courtier remarked, "He is not afraid."

"Why should the pleasing face of a gentlewoman effray me?" the cleric asked. "I have looked in the faces of many angry men, and yet have not been afraid above measure."

A dwelling at the foot of High Street, not far from the cathedral, is named John Knox's House; the Reformer probably died there.

Calling it a day, Miss Revis and I dropped in at a near-by restaurant for tea. As we relished our fish-and-chips, tea, and cakes, we recalled that the travelers in Tobias Smollett's novel *Humphry Clinker* once dined hard by in Carrubber's Close. Their menu: singed sheep's head and haggis.

Said one: "The last, being a mess of minced lights [lungs], livers, suet, oatmeal, onions, and pepper, inclosed in a sheep's stomach, had a very sudden effect upon mine."

During our stay in Edinburgh, Queen Elizabeth paid a visit to this Scottish royal seat. Her Majesty dedicated the imposing new National Library of Scotland, thereby acknowledging the riches of the city's literary associations, past and present. For the royal visit Edinburgh was gay with silvered lampposts.





fluttering flags, and flowerpots tucked everywhere like Easter eggs.

It was a "blinky" day of alternating sun and cloud when we threaded our way through new housing schemes south of Edinburgh, bound for Roslin and the romantic valley of the North Esk. Soon the view expanded. To the west lay the Pentland Hills; southward rolled the blue Moorfoots.

By a steep, winding road we descended to Lasswade, where Thomas De Quincey, author of *Confessions of an English Opium-Eater*, spent the last part of his life. His house still stands in the crook of the brae.

De Quincey's three daughters kept house for him. He was a disturbing man to live with, having a habit of accidentally setting piles of paper afire with the candle he read by.

"Papa, your hair is burning!" one would say to her father, absorbed in a book.

"Is it, my love?" And he would put out the blaze with utmost unconcern.

To a cottage that still stands in Lasswade, Sir Walter Scott brought his bride, Charlotte Carpenter, in 1798.

"It was our first country house when newly married," said Scott. "Many a contrivance we had to make it comfortable. I made a dining table for it with my own hands."

At this table the Scotts entertained notable visitors, including Wordsworth and his sister Dorothy, whom they met here for the first time on September 17, 1803.

The Wordsworths left their inn at Roslin so early they arrived before the Scotts were

out of bed. They all breakfasted together, and the Wordsworths stayed till 2 p.m. Scott was then writing *The Lay of the Last Minstrel*, his first great work:

O listen, listen, ladies gay!
No haughty feat of arms I tell;
Soft is the note, and sad the lay,
That mourns the lovely Rosabelle.

He read four cantos to Wordsworth. "Partly read and partly recited . . . in an enthusiastic style of chant. . . The easy glowing energy greatly delighted me," related Wordsworth.

Poet's Memories Undimmed by Distance

Miss Revis and I returned to Edinburgh by circling the Pentlands. This lovely drive took us amid the hills Stevenson recalled with such nostalgia from the South Pacific:

The tropics vanish, and meseems that I,
From Halkerside, from topmost Allermuir,
Or steep Caerketton, dreaming gaze again.

We skirted the rocky pass in the Pentlands known as the Cauld Stane Slap ("slap" meaning gap or pass).^{*} This is one of the settings of Stevenson's unfinished masterpiece, *Weir of Hermiston*. He was working on it the day of his death. With the words "a wilful convulsion of brute nature," the great romance breaks off forever.

Next day we set out for the valley of the Tweed, our first goal "Scott's View" of the Eildon Hills from the heights above Bemersyde. Here the river makes a horseshoe bend and flows down past Dryburgh Abbey, where Scott lies buried.

Driving out from his beloved home of Abbotsford, Sir Walter was wont to halt his carriage on the high road at Bemersyde and feast his eyes upon the hills he loved. The road has lately been widened to accommodate the cars and buses bringing visitors from all over the world to gaze upon the scene Scott admired (page 441).

Set in a meadow rimmed by trees where birds seem to chorus constantly, Dryburgh Abbey's noble ruins stand lapped in the peace of centuries. To my mind it is the loveliest of all Scottish abbeys. Here Scott lies within sound of the murmuring Tweed, whose voice was the last to lull his mortal ears on that September afternoon in 1832 which put Britain into mourning as if a king had died.

Scott was trained as a lawyer, and it was

^{*} See "A Stroll to London," by Isobel Wylie Hutchison, NATIONAL GEOGRAPHIC MAGAZINE, August, 1950.

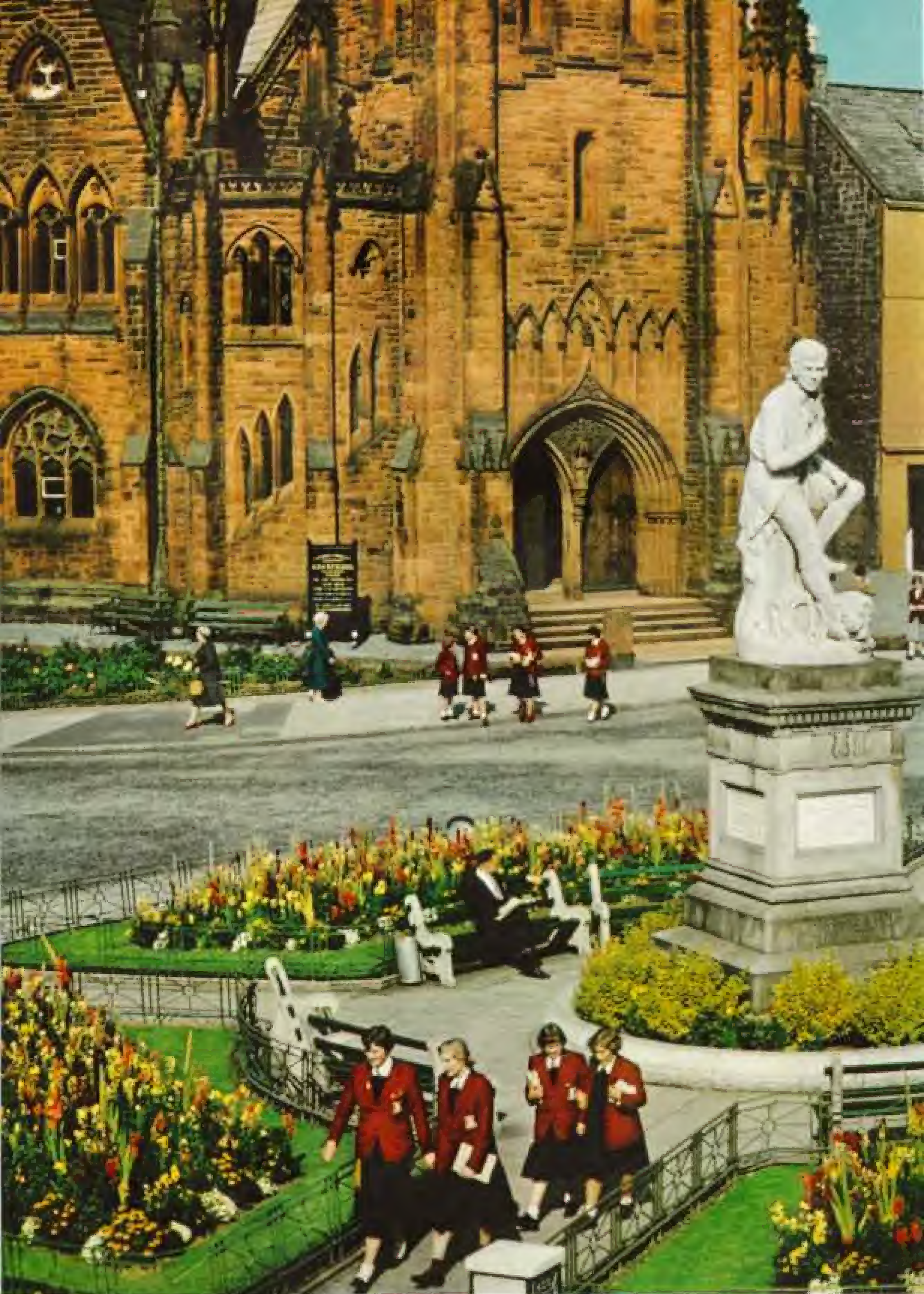
◀ From Dunsinane Hill Macbeth Saw a Forest Move to Seal His Doom

In Shakespeare's tragedy, Macbeth and his lady murder King Duncan and ascend Scotland's throne. Though their crime is suspected, the usurper feels secure in a ghostly prophecy that "Macbeth shall never vanquish'd be until great Birnam Wood to high Dunsinane Hill shall come against him."

Preparing to make a stand, Macbeth moves to Dunsinane's hilltop castle, where Lady Macbeth dies, maddened by guilt. Grief-stricken, her husband cries, "Life's . . . a tale told by an idiot, full of sound and fury, signifying nothing."

Meanwhile, Malcolm, the rightful king, orders his soldiers to attack the castle. First they cut down Birnam Wood to conceal their numbers in leafy boughs. Macbeth, now aware that the prophecy spells for him not safety but defeat, despairingly throws himself into battle, shouting, "Lay on, Macduff, and damn'd be him that first cries 'Hold, enough!'"

Here a boy and sheep share a sense of curiosity, one for the other. Heather splashes the hill. Ruins of the ancient fortress crown the summit.





his appointment as Sheriff of Ettrick Forest (Selkirkshire) that brought him to the Tweed-side. His first home was Ashiestiel, a house rented from his cousin. There Scott spent his happiest years and wrote much of his poetry.

We had our high tea in a hotel in Selkirk, center of Scott's sheriffdom. This repast included steak, French fried potatoes, and tomato salad, topped off with tea and cakes. Miss Revis had some trouble identifying such a feast with "tea."

At Flodden Field, 25 miles from Selkirk, King James IV of Scotland and the flower of his nobility perished in 1513 fighting against the English.

I've heard them liting at our ewe-milking,
Lasses o' liting before dawn o' day;
But now they are moaning on ilka green
loaning—
The Flowers of the Forest are a' wude away.

So wrote Jane Elliot nearly 250 years later. A Scottish bagpipe lament, "The Flowers of the Forest," also mourns that historic battle.

In lighter vein, there is a story Scott often told about a horse doctor he had known. Meeting him later posing as a practicing physician in the north of England, the astonished Scott learned that he was doing well, although his only medicines were "laud-amy" and "calamy" (laudanum and calomel). When asked if any patients succumbed to these rather harsh specifics, he replied:

"Ou ay, may be sae! Whiles they die an' whiles no, but it's the will o' Providence. Ony how, your Honour, it wad be lang before it makes up for Flodden!"

Secrets Sealed in Scott's Desk Drawer

In 1811 Scott's lease of Ashiestiel expired, and he purchased a run-down farm called "Clarty Hole" near Melrose, renaming it Abbotsford. The splendid house he built there is inhabited today by Scott's great-great-great-granddaughters, who generously open it to the public each summer (page 438).

Here may be seen Scott's home almost as he knew it. In his desk a secret drawer remained undiscovered till 1935. It contained 57 letters, part of the correspondence between Walter and Charlotte before and after their marriage. These were published in 1937. Here too is the library of 10,000 volumes; the drawing room with its hand-painted Chinese wallpaper; the poet's hat, shoes, and vest—the last he wore—and countless other treasures.

Many famous persons were Scott's guests at Abbotsford, among them Wordsworth, Thomas Moore, and novelist Maria Edgeworth. Washington Irving called unannounced one morning and got a great welcome.

"Ye're just in time for breakfast," cried Scott, hastening up the path to meet him, "and afterwards ye shall see all the wonders of the Abbey!"

Scott delighted to act as guide to Melrose Abbey (page 446), which he describes so minutely in *The Lay of the Last Minstrel*:

If thou wouldst view fair Melrose aright,
Go visit it by the pale moonlight;
For the gay beams of lightsome day
Gild, but to flout, the ruins gray.

So he wrote. But rumor says that he himself never visited the ruins by moonlight!

Horsemen Ride Town Boundaries

When we visited Abbotsford, photographers from Walt Disney Productions were filming a local festival in near-by Galashiels, where the town boundaries are patrolled on a certain day each year. The ceremony, common to several Border and other burghs in Scotland, is known as "Riding the Marches." Though Galashiels' festival dates only from 1930, in Hawick the "Common Riding" (as it is called there) goes back before the time of Flodden, when boundaries were often the subject of bloody dispute (pages 439, 458).

Our tour in the Scott country ended with a visit to Scott's earliest home there, the farm of Sandyknowe close by the fortified tower of Smalholm. From the tower's summit fires once flared to warn of English raids.

Threatened with lameness after a fever, the three-year-old Scott was sent to the home of his grandfather, Robert Scott, at Sandyknowe. No fewer than six of the family—Walter was the ninth child—had already died in infancy in the unhealthy atmosphere of Edinburgh's College Wynd. But Sandyknowe's breezes seemingly helped Walter's health, and the colorful Border history fired his interest in romantic adventure.

Sandy Ormiston the Shepherd was the youthful Scott's devoted companion. The old man "charm'd my fancy's wakening hour" with many a tale of Border forays.

The boy often lay out amongst the sheep, or on the parlor floor, swathed in the "Tartar-like habiliment" of a sheepskin, "warm as it was flayed from the carcass of the animal"—

(Continued on page 461)



A Rock Cave Along Galloway Coast Concealed the Smugglers in Scott's *Guy Mannering*



Haunted by Violence, Dunrobin Castle Broods over the Sea That Hones Its Cliffs

This rock was already a place of strength when St. Ninian, apostle to Pictland, founded a church here in the 5th century. Later the headland became an impregnable fortress. Part of the massive castle dates from the 1500's. Keep, stable, and storehouses crumble with age. Parapet in upper left guards the only link to the mainland.



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Here Scott Met "Old Mortality," the Inspiration for His Novel of *Covenanters Days*

In 1685 Royalists herded into the castle dungeon 122 men and 45 women of the Presbyterian faith. Starved and beaten, many prisoners died and were buried near by. Some 100 years later one Robert Paterson, a stonemason known as "Old Mortality," stopped here on a self-appointed mission to repair the tombs of all Covenant martyrs.



Brig o' Doon Saved Tam o' Shanter from Witches and Warlocks of the "Hellish Legion"

In Robert Burns's poem, *Tam o' Shanter*, the hero repaired to an inn to drink with Souter Johnie, "his ancient, trusty, drouthy cronie." "Minutes wing'd their way wi' pleasure" until Tam started home "on his gray mare, Meg, a better never lifted leg." Along the way "Tam saw an unco sight! Warlocks and witches in a dance." Pursued, he raced for Brig o' Doon, because "a running stream they dare na cross." Only pedestrians use the old bridge today. → Ayr preserves Tam o' Shanter Inn, and Kirkoawald keeps Souter Johnie's home (lower). Stone landlord, Tam, and Johnie illustrate the line, "The night drove on wi' songs an' clatter; and ay the ale was growing better."





Hawick Remembers the Battle of Flodden, Where the Flower of Its Manhood Perished

In 1513 Scotland's James IV invaded England and met defeat on Flodden Field. A year later, when Border raiders rode to attack Hawick, the town's few remaining fighters ambushed and slew them, a clash re-enacted yearly.



Heralds with Halberds Lead the Parade on a Misty Day During the Annual Common Riding
Poet John Leyden wrote of the town's part in Flodden: "Boast, Hawick, boast! . . . Thy sons, a hardy band, unwont to yield, fell with their martial King, and, glorious boast! gain'd proud renown where Scotia's fame was lost."



an old Scottish remedy used for lameness.

It was at Sandyknowe that the infant Walter once was found in a thunderstorm fearlessly watching the lightning flashes and crying ecstatically, "Bonnie! Bonnie! Dae't again, dae't again!"

Motoring through the flowering valley on our way to Moffat, we found picnickers encamped at almost every turn of the beautiful Yarrow Water. At the head of the valley rolling green hills enfolded the seven-mile circumference of St. Mary's Loch, always a favorite with travelers.

Songs "Made for Singing"

Here a statue of poet James Hogg was appropriately surrounded by grazing sheep. Hogg, "the Ettrick Shepherd," sits with his stone dog at his feet, one hand on his crook. The other bears a scroll with the last line from his own poem *The Queen's Wake*: "Have taught the wandering winds to sing."

Hogg, who had only six months of formal schooling, learned Border lore at his mother's knee. He met Scott when the latter was gathering material for his *Minstrelsy of the Scottish Border*. Scott profited from this acquaintance, for Hogg was a master in his own field of rhymed ballad. Mrs. Hogg taught Scott the folk song "Auld Maitland."

"Has it ever been printed?" the poet asked.

"Oo na, na, sir," the lady replied. "There was never ane o' my sangs prentit till ye prentit them yourself, an' ye hae spoilt them a'thegither. They war made for singing, an' no for reading; but ye hae broken the charm now, an' they'll never be sung mair. An' the worst thing of a', they're nouthar right spell'd nor right setten' down!"

The road from St. Mary's Loch to Moffat leads past a narrow glen. At its head the

Grey Mare's Tail, a spectacular waterfall celebrated by Scott, pours over the rocks in a 300-foot cascade.

We were traveling now toward Galloway through the country of Thomas Carlyle and John Buchan. When he became Governor General of Canada in 1935, Buchan took his title, Lord Tweedsmuir, from a village in this region. He went to the university in Glasgow and later vividly portrayed the city in his novel *Huntingtower*. His famous spy-thriller, *The Thirty-nine Steps*, takes Galloway for its background. A classic of its kind, this novel was converted by Alfred Hitchcock into a spine-chilling motion picture.

Buchan's wife, Lady Tweedsmuir, once described a family journey through the wilds of western Canada in the NATIONAL GEOGRAPHIC MAGAZINE.*

We paused at Ecclefechan to visit the birthplace of Thomas Carlyle, son of a stonemason. The small house is now the property of Scotland's National Trust.

Mother and Son Smoked Clay Pipes

Carlyle used to sit with his mother outside her door, keeping her company as they both puffed at their clay pipes. The fiery historian and essayist is buried at Ecclefechan with his family; his wife Jane lies in the precincts of Haddington's beautiful church, "The Lamp of Lothian."

Carlyle himself offered the grave inscription: "And the light of his life, as if gone out." And the light had truly died, for after his wife's death, Carlyle wrote little more.

Sir James Barrie's mother greatly admired Carlyle's books. Barrie, in his biography of her, tells how she would read Carlyle, entranced, for hours:

"There were times, she held, when Carlyle must have made his wife a glorious woman. 'As when?' I might inquire. 'When she keeked [pecked] in at his study door and said to herself, 'The whole world is ringing with his fame and he is my man!'" 'And then,' I might point out, 'he would roar to her to shut the door.' 'Pooh,' said my mother, 'a man's roar is neither here nor there.'"

In Dumfries we visited the crowded churchyard of St. Michael's, where the great Robert Burns sleeps his last sleep under a Grecian mausoleum. In death he has found the ac-

◀ "Heartsome . . . to See the Rising Plants" Poet Allan Ramsay Stands by Edinburgh's Floral Clock

Ramsay's finest poem, *The Gentle Shepherd*, portrays in Lowland dialect the rustic life of his native Lowther Hills.

How halesome is't to snuff the cawler air,
And all the sweets it bears, when void of
care!

The poet's natural style amid the artificiality of the early 1700's paved the way for Robert Burns.

Throngs on Princes Street have admired the clock since 1905. A mechanism below the blooms drives the hands.

* See "Tweedsmuir Park: The Diary of a Pilgrimage," by The Lady Tweedsmuir of Elsfield, NATIONAL GEOGRAPHIC MAGAZINE, April, 1938.

Edinburgh's Police Band
Peals a Wild Highland
Melody on the Bagpipes

Bagpipe music swirls through the poetic history of Scotland like a stirring refrain. "Fhairsan gware a feul against the clan M'Tavish," wrote William E. Aytoun in *The Massacre of the Macpherson*, "...for he did resolve to extirpate the vipers, with four-and-twenty men and five-and-thirty pipers."

Wearing the Royal Stewart tartan, members of this band perform on the Mound just off Princes Street. Columns at left mark the Royal Scottish Academy.

Opposite, lower: Andrew Reiri in his Edinburgh home plays out lines from Robert Louis Stevenson's *The Land of Counterpane*:

And sometimes for an hour
or so
I watched my leaden sol-
diers go,
With different uniforms and
drills,
Among the bed-clothes,
through the hills.

✦ Toy soldiers came to life at the Edinburgh Military Tattoo. Royal Artillerymen dress as Redcoats for a mock attack.

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All Redcoatsmen by Kathleen Reed,
National Geographic Photographer





claim and the peace that eluded him during his short, bitterly disappointing lifetime. Near by stands the house where Burns died; a constant flow of visitors wanders at will through its five small rooms.

It was gloaming when we reached Ellisland, five miles from Dumfries, the poet's farm before he was appointed excise officer—collector of duties on spirits and tobacco—for the district. There we saw the path beside the River Nith where Burns strolled while composing *Tam o' Shanter*.

Ah, gentle dames! it gars me greet,
To think how many counsels sweet,
How many lengthen'd sage advices,
The husband frae the wife despises!

At Ellisland, Burns also wrote his touching lyric *The Wounded Hare*. Ellisland's custodian, hoeing roses in the garden, knew all about it. "It was yonder, in the last field. He saw the man shoot it and he would have drowned him!"

Burns's love for all creatures is tenderly expressed in *To A Mouse, on turning her up in her nest with the plough, November, 1785*.

Wee sleeket, cowrin' tim'rous beastie,
O, what a panic's in thy breastie!
Thou need na start awa' sae hasty,
Wi' bickerin' brattle!
I wad be laith to rin an' chase thee,
Wi' murd'erin' pattle! *

Next morning we left Dumfries for Solway-side. Near the huge gray ruins of Caerlaverock Castle lies the grave of a pious mason named Robert Paterson. He was the inspiration for the title character in Scott's novel, *Old Mortality*, based on the rebellion of a religious group, the Covenanters, against King Charles II in 1679. Paterson, like the fictional "Old Mortality," wandered over Scotland erecting and repairing the gravestones of Covenanters killed in the rebellion.

Rugged Shore Recalls Smugglers

Along the Solway coast Stevenson laid the scene of *The Master of Ballantrae*, though he named his book for an Ayrshire village. Here too Scott set much of his great romance *Guy Mannering*.

Leaving our car parked in a roadside quarry, we clambered down to the shore through steep woods. It was now late afternoon and the water of Fleet Bay lay still as glass. Only the clamor of gulls broke the solitude. Yel-

low iris grew in the runnels; seaweed salted the air. The eroding sea had carved the headlands into arches and caves.

This lonely, rugged shore seemed a fitting resort for the tall figure of Meg Merrilies, the Gypsy, and Dirk Hatteraick, the betrayed smuggler of *Guy Mannering*. Though we searched in vain among the crags for the entrance to Dirk's cave, we did stumble upon a dark, man-made tunnel (page 453). In the dim twilight it was easy to imagine suddenly coming face to face with smugglers or wreckers or hearing Dirk's harsh voice calling out to Meg, "Beldam! Deyvil's kind! What makest thou there?"

Gay Wedding Brightens Poet's Birthplace

Next day we experienced something of John Keats's delighted surprise when, climbing over Galloway's mountains into Ayrshire, we suddenly saw, far below to westward, the shining sea and soaring peaks of the Island of Arran.

"I had no Conception that the native place of Burns was so beautiful," wrote Keats when he passed this way in 1818.

The "auld clay biggin'" at Alloway, where Burns was born in 1759, attracts thousands of visitors annually, from the Queen, who visited it in 1956, to the humblest of her subjects. Countless others come from overseas.

We found Alloway in gay humor. A wedding was taking place in the church facing Burns's "auld haunted kirk," where Tam o' Shanter saw an "unco' sight":

Warlocks and witches in a dance;
Nae cotillion brent new frae France,
But hornpipes, figs, strathspeys, and reels,
Put life and mettle in their heels.

Life and mettle were in the heels of Alloway again this morning. Cars were setting down guests in festive attire. Presently, attended by four maids in blue, the bride arrived and walked up the steps to the church. I could not help thinking of another of Burns's poems:

My Love is like a red, red rose,
That's newly sprung in June;
My Love is like the melodie,
That's sweetly play'd in tune.

A short drive east of Alloway stands a handsome mansion built by Lord Auchinleck, Boswell's father. Though our visit was unannounced, nothing could have been kinder than our reception by its present occupants. Also named Boswell, they are a collateral

* "Bickering brattle" meant a noisy scamper, and "pattle" was a metal plow scraper.



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† George D. Blackwood (Seated) Directs
Edinburgh's Famed Publishing House

Founded in 1817, *Blackwood's Magazine* brought out works by Scott, George Eliot, Anthony Trollope, and others. Mr. Blackwood's family has edited the magazine for five continuous generations.

‡ Smoked Walls, Bog Oak, and Pewter Keep
the Look of an Inn from *Rob Roy*

Here Bailie Nicol Jarvie, the "bewigged, bustling, and breathless" magistrate of Scott's novel, fought lawless Highlanders with a red-hot poker. Alastair D. Cameron (right) owns this modern hotel on the site.



branch of the family of the immortal biographer, whose long-forgotten journals are a present-day literary sensation.

When Dr. Johnson visited Auchinleck with Boswell in 1773 he preferred "the sullen dignity of the old castle," which lay in ruins on the bank of the Lugar, to the fine new mansion designed for Lord Auchinleck by the famous architect Robert Adam.

The impetuous Boswell told Johnson that he hoped, if he survived his friend, to erect a memorial for him in the grounds. But Dr. Johnson, who "could not bear to have death presented to him in any shape," closed the topic with an abrupt, "Sir, I hope to see your grandchildren!"

From Ayrshire we went north to Loch

Lomond, held by many to be Scotland's most beautiful inland stretch of water (page 469). It is also the largest. A Jacobite soldier whose name is unknown reputedly wrote the song that made the lake forever famous:

For ye'll tak' the high road and I'll tak' the
low road
And I'll be in Scotland before ye,
But me and my true love we'll never meet
again
On the bonnie bonnie banks o' Loch Lomond.

Tucked away behind Ben Lomond lies lovely Loch Katrine, celebrated by Scott in *The Lady of the Lake*:

One burnished sheet of living gold,
Loch-Katrine lay beneath him rolled.

Escaped from Edinburgh, the Hero of *St. Ives* Found Refuge in Such a Swanston Cottage ♣



Here a little vessel named *Sir Walter Scott* carries hundreds of tourists on summer days past Ellen's Isle. The sequestered shores of Loch Katrine formerly were the resort of Highland cattle rustlers and freebooters known as "caterans." Such an outlaw was Rob Roy, who exacted blackmail for "protection" of cattle drovers.

Loch Katrine forms an important part of Glasgow's water supply. Approaching the Panama Canal on a Scottish vessel some years ago, I was assured by the nostalgia-smitten captain that I still was drinking Loch Katrine.

Our next stop was Inveraray on Loch Fyne. This village was the setting for a chilling episode in Stevenson's *Catriona*, a sequel to

Robert Louis Stevenson Wrote the Novel →

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Kidnapped. This part of the novel is not fiction, but true history. Here the hapless James Stewart was tried by a jury of 15 men, 11 of whom were members of the enemy Clan Campbell. Even the presiding judge was a Campbell.

Stewart stood trial for the murder of Colin Campbell of Glenure, nicknamed the Red Fox. It was foreordained that Stewart would be executed for the crime.

Bracken Cloaks the Crofts of Mull

We motored on to Oban and crossed to the Island of Mull (page 473). We were bound for Iona, home of St. Columba, where Scotland's earliest kings are buried.

On Mull we were close to the islet of Erraid, where David Balfour, the hero of *Kidnapped*, spent such unhappy hours "trapped" by the water—until he found he could walk ashore at low tide!

Mull's abandoned crofts and pastures, overgrown with bracken, testify to the island's continuing loss of population. But the resulting solitude is restful for visitors.

From the windows of our hotel in the sleepy port of Bunessan we watched West Highland cattle, with their shaggy hair and wide, curved horns, wander down from the



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*"She's a' the World tae Me;
And for Bonnie Annie Laurie,
I'd Lay Me Down and Die"*

In the late 17th century, tradition holds, a young army captain named William Douglas fell in love with Annie Laurie, belle of Maxwellton House (left), and wrote the love song. But Annie married another and became the mother of Craigharroch, hero of Burns's poem, *The Whistle*.

Above: Annie's portrait hangs in Maxwellton House, still occupied by a Laurie. Lady John Scott revised the poem in the form now known.

‡ Cyclists rest "On the bonnie, bonnie banks o' Loch Lomond."







hills each morning to stand idly in the village's one street chewing their cud. Sometimes they ambled far out in the bay at ebb tide to cool their hoofs and shanks.

I took a dip in the ocean. Miss Revis shuddered, asking how I could stand such cold water.

"Why, it can't be invigorating if it isn't cold," I explained. Miss Revis remained politely skeptical.

From Mull we could visit Iona at leisure. And this island demands leisure. Here, where Christianity took root in Scotland, we breathed an atmosphere of peace and charm which is incommunicable to those who have not been there. Thriving Iona, once known to devout Scots as Colmekill, Columba's Isle, has tidy pastures, cropped close by sheep, and beaches of shining white sand.

Scottish Kings Rest on Iona

In summer the Oban steamer disgorges throngs of tourists on the island every weekday. They swarm through the cloisters of the ruined nunnery, inspect the tempting stall of Highland Home Industries at its gate (some never get farther!), then go on to the cathedral and the burial ground, Reilig Odhrain.

Here, according to a 16th-century chronicler, rest 48 Scottish monarchs from A. D. 1057 and before. Here also lies Marjory Kennedy-Fraser, queen of Hebridean song, who did so much, with her friend and collaborator, Kenneth MacLeod, to keep alive the hauntingly beautiful music of the Gael.

Shakespeare refers to the Reilig Odhrain in *Macbeth*, when Macduff is asked where Duncan's body lies and answers:

Carried to Colmekill,
The sacred storehouse of his predecessors
And guardian of their bones.

When Queen Elizabeth landed on Iona in August, 1956, she was the first monarch, English or Scottish, to visit the island since the days of Malcolm Canmore and his Queen Margaret 900 years before.

St. Columba, born of a royal line in Donegal, Ireland, landed on Iona A. D. 563 and founded a church of which no trace remains. The present Iona cathedral is almost entirely late 15th- and early 16th-century work.

*"Bird of the Graces, Dear Sea-mew,
Whose Note Was Like the Halcyon's Song"*

Andrew Lang's lines come to life in the beautiful and effortless soaring of these gulls off the coast of Mull. Duart Castle (right) bulks stark and forbidding on a headland of the island.



On the last day of his life, June 8, 597, Columba—according to his biographer, St. Adamnan—blessed his old white horse and ascended a near-by knoll to bless his monastery. Then, returning to his hut, he continued his work of transcribing the Psalter.

At midnight Columba was found lying before the altar, his face shining with "wonderful cheerfulness and joy of countenance on seeing the holy Angels coming to meet him."

Clan Warfare Darkened Glencoe

Returning to Oban, we set out by road for Skye. Our way led through Glencoe, where we were again in the country of *Kidnapped*.

Glencoe, the historic mountain-walled valley of the River Coe, is now largely owned by Scotland's National Trust. It has been the setting of many a romance since the days of *Kidnapped*, in which Stevenson spoke of Glencoe's "prodigious valley, strewn with rocks and where ran a foaming river."

But the valley is most famous for a bloody scene of clan warfare. Here, at dawn on February 13, 1692, the members of one clan suddenly fell upon their hosts of two weeks, the Macdonalds. The attackers put to the sword Macdonald men, women, and even children, believing the Macdonald chief had not taken his required oath of allegiance to King William III.

Some of the soldiers, it is said, tried to warn their victims. Legend has it that the attacking clan's own piper tried to convey a hint of trouble to come by playing an ominous air, "Wives of the Glen."

In a scenic spot in the pass of Glencoe we met an old linker in Macdonald tartan who waylays travelers and performs for them energetically on the bagpipes. Miss Revis

◀ "What with the Songs, and the Sea Air ... the Passage Was a Pretty Thing"

Robert Louis Stevenson in *Kidnapped* recounts the adventures of David Balfour, whose uncle had him abducted. Escaping his captors, the hero took a ferry from the Island of Mull to the Scottish mainland. His trip across the Sound of Mull "was a very slow affair" but not unpleasant.

These passengers sail to Mull with the same "good-nature and spirit... and... bright weather" that David experienced.

Of distant Morven, Stevenson wrote: "The sea in all this part running deep into the mountains and winding about their roots... makes the country strong to hold and difficult to travel, but full of... wild and dreadful prospects."

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and I considered this colorful interlude well worth the toll exacted.

At Kyle of Lochalsh we ferried over to Skye. No Scottish isle is more celebrated in song and story than the "Misty Isle of Skye," with its saga of Prince Charles Edward Stuart (Bonnie Prince Charlie) and Flora Macdonald (page 474).*

Skye is a glorious island. Whitewashed cottages huddle in green glens close to the seashore. Haystacks dot fields bright with wild flowers. Stacks of brick-shaped peat chunks stand to dry beside the shallow excavations in the turf that yielded them up.

Though Prince Charles Edward Stuart, ill-fated pretender to the English throne, was in Skye for only a few days, his story has given the island an imperishable glamour.

Farmer's Daughter Aided Fleeing Prince

After his disastrous defeat by the Duke of Cumberland at Culloden Moor in 1746, Prince Charles fled to Monkstadt, on Skye's northern coast. His flight was aided by an ardent Jacobite, Flora Macdonald, a Hebridean farmer's daughter. He gave his preserver a lock "of his lang yellow hair" before bidding her a last farewell. Poor fellow! He had little else to give.

Flora later married her dark-haired cousin, Allan Macdonald. The pair entertained Boswell and Johnson at Kingsburgh in 1773. Johnson penned the words now gravied on Flora's cross at Kilmuir churchyard in Skye and on her statue in Inverness:

"Her name will be mentioned in history, and if courage and fidelity be virtues, mentioned with honour."

The venerable fortress of Dunvegan on Skye has been the home of the MacLeods for 700 years. The present clan chief, Dame Flora MacLeod of MacLeod, invited Miss Revis and me to lunch. We thus sampled at first-hand the hospitality that has made Dunvegan famous.

Our hostess received us in a library whose windows overlook the sea loch from which the castle rises on its rock. Then we set out to tour the castle. It was hard to keep up with Dame Flora's small, bustling, tartan-clad figure, though the head of Clan MacLeod had put more than threescore and ten years behind her.

* See "Over the Sea to Scotland's Skye," by Robert J. Reynolds, NATIONAL GEOGRAPHIC MAGAZINE, July, 1952.



"Speed Bonnie Boat Like a Bird on the Wing, 'Onward' the Sailors Cry: Carry the Lad . . .

Hunted by English troops after his defeat at Culloden Moor in 1746, Prince Charles Edward fled to Skye in an open boat; he wore the disguise of a servant to Flora Macdonald. Years later, on a tour of the Hebrides, Dr. Samuel Johnson and James Boswell visited Flora and recorded her story of the Prince's adventure.



... *That's Born to Be King over the Sea to Skye.*" Harold Boulton's Song of Prince Charlie

Portree, headquarters of a fishing fleet, has grown since Boswell wrote, "Sir James Macdonald intended to have built a village here, which would have done great good. A village is like a heart to a country." Dr. Johnson's only comment: "I long to be again in civilized life." This steamer links the island to mainland.



Her enthusiasm sparkled over everything she showed us, from the bedrooms occupied by Boswell and Johnson in 1773 to the bottle-neck dungeon where MacLeods of old were able to dispose of unwanted visitors. The name comes from its odd shape, with a bottle-neck opening on top through which prisoners could be dropped.

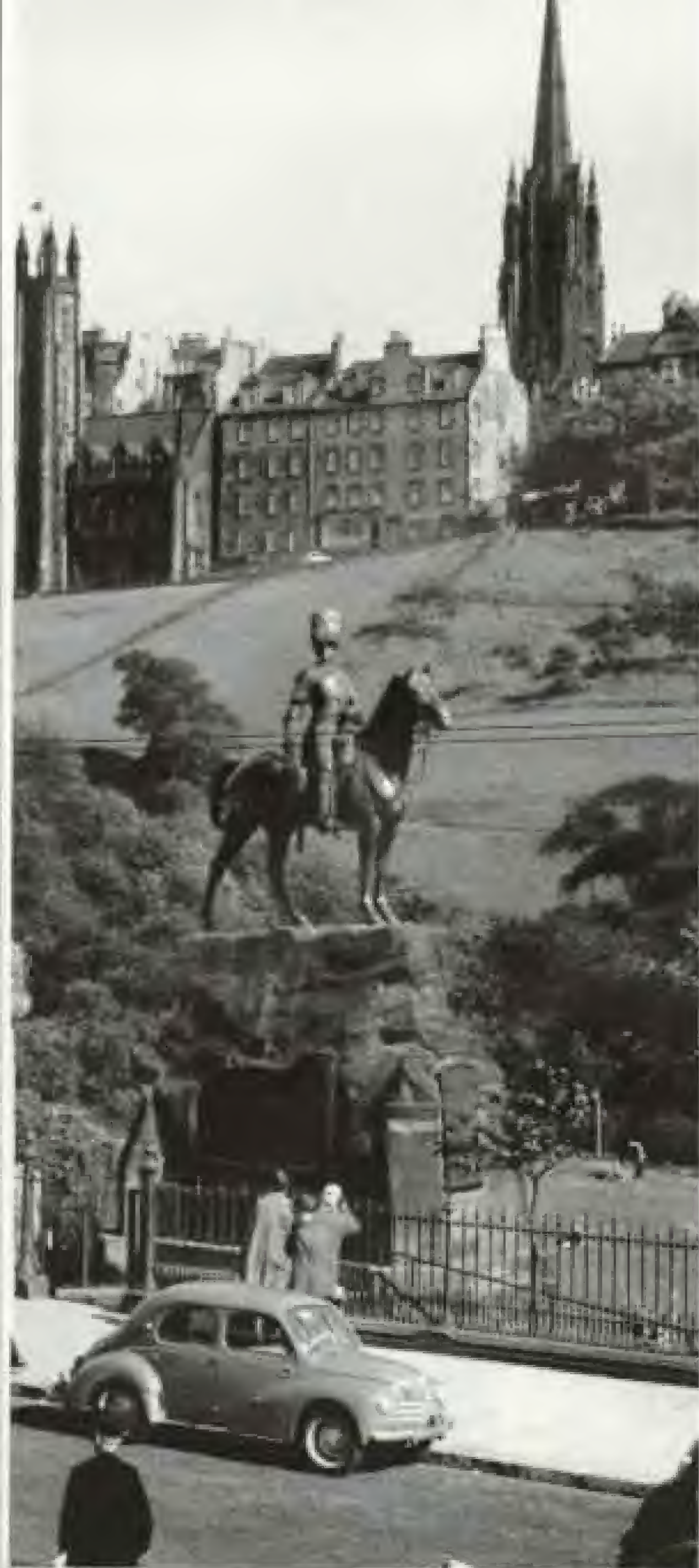
Dame Flora's forebears entertained Boswell and Dr. Johnson for eight days, and Dr. Johnson could hardly tear himself from Dunvegan. So elegant was his entertainment that he became quite joyous.

"Boswell," he said, laughing, "we came in at the wrong end of the island."

"Sir," said Boswell, "it was best to keep this for the last."

"I would have it both first and last," the good doctor answered.

From Johnson—whose tongue and wit were usually equally sharp—this was an astounding tribute. Indeed, when a Scot once praised his country's noble prospects, or vistas, Johnson thundered: "Sir, I believe the noblest prospect that a Scotsman ever sees is the road which leads him to England!"



Dame Flora proudly pointed out a framed letter from Sir Walter Scott, another Dunvegan guest. It is an apology for the poet's tardiness in acknowledging the hospitality of an earlier chief of Clan Mackeod.

In August, 1956, Queen Elizabeth, touring the Hebrides, lunched at the castle on a day of sunshine and heather tang.

As we lingered in the big portrait-lined dining room over coffee and Dame Flora's lively talk, the clock struck two, the hour for the castle's afternoon opening. The first cars had arrived, and tourists were already enter-

"What a Poem Is That Princes Street!"
Wrote Alexander Smith of Edinburgh

"The puppets of the busy, many-coloured hour move about on its pavement, while across the ravine Time has piled up the Old Town, ridge on ridge, gray as a rocky coast washed and worn by the foam of centuries; peaked and jagged by gable and roof, windowed from basement to cope. . . . The New is there looking at the Old. Two Times are brought face to face, and are yet separated by a thousand years."

At left the domed Bank of Scotland rises above the low, columned National Gallery. St. Giles' "nicely crown" shows beyond the bank.

Equestrian statue at right memorializes the Royal Scots Greys who fell in the South African War.

ing the outer hall. We rose to take our leave.

Next morning in radiant sunshine we ferried back to the mainland and headed through Glen Moriston, where Prince Charles lay concealed for a week after his defeat at Culloden. Though there was a price of £30,000 on his head, not a Highlander would betray him.

One follower, Roderick Mackenzie, who closely resembled his leader, was captured and fatally wounded. As he died, he cried out, "You have killed your prince!" His captors, joyfully believing they had indeed taken Prince Charles, cut off his head. Highlanders who knew the truth guarded the secret, and for some time pursuing English troops gave up the search for Bonnie Prince Charlie. Eventually he escaped to France. Though he lived on for another 42 years, never again did he seriously threaten to recapture the throne of his ancestors.

Tree Wears a Poker in Rob Roy Country

Soon we came to Aberfoyle in the country of Scott's *Rob Roy*, a story of Jacobite intrigues starring the historical outlaw, Rob Roy Macgregor. A delightful character in the novel is Bailie Nicol Jarvie, who on one occasion snatched up a hot poker to repel his assailants. Aberfoyle today has a hotel named the Bailie Nicol Jarvie (page 465)—and in a tree near by hangs a poker.

Miss Revis and I had a rendezvous, of course, with the native place of J. M. Barrie, whose *Peter Pan* has beguiled generations of children—and their parents (page 488). So one day we stood at the top of the hiee at Kirriemuir, a town in County Angus, which I had visited in my stroll to John o' Groat's.*

Barrie's Kirriemuir birthplace, in a section known as "The Tenements," belongs to Scot-

* See "A Stroll to John o' Groat's," by Isobel Wylie Hutchison, NATIONAL GEOGRAPHIC MAGAZINE, July, 1956.



land's National Trust. At Strath View house, on July 9, 1894, Barrie was married to Mary Ansell, the actress. Here too he wrote *The Little Minister*, and here his sister and mother died within three days of each other.

Near Kirriemuir, in the vale of Strathmore, stands Glamis Castle. All Peter Pan's fairies cannot dispel Shakespeare's brooding shadow here. The great castle stands in the valley, says tradition, because the fairies would have none of it on their private preserve—the heights above—and kept tearing it down.

Macbeth Lives On, Forever Wakeful

Shakespeare's powerful tragedy tells how the Thane of Glamis, Macbeth—goaded by his wife and driven by his own ambition—murdered Duncan, King of Scotland. Macbeth's castle in Inverness was the scene of the crime.

Methought I heard a voice cry "Sleep no more!
Macbeth does murder sleep"—the innocent sleep,
Sleep that knits up the ravell'd sleeve of care.

To Glamis, centuries later, came Mary Queen of Scots in merry mood. Here today can be seen her dinner menu, written in French. Her ladies in waiting, the famous four Marys—themselves the subject of a poignant Scots folk ballad—spent their time at Glamis covering a chair with their beautiful





◀ The 15-year-old Scott Meets Burns in His Prime

Years later Sir Walter wrote his impressions of this memorable encounter. It took place in the home of "venerable Professor Ferguson's . . . we youngsters sat silent, looked and listened."

Robert Burns observed a print on the wall and asked who wrote the lines beneath it.

"Nobody but myself," Scott said, "remembered that they occur in a half-forgotten poem of Langhorne's . . . I whispered my information to a friend present, who mentioned it to Burns, who rewarded me with a look and a word, which . . . I then received, and still recollect, with very great pleasure."

Charles Martin Flaxie executed the painting of the meeting.

♣ Scott Reads to Friends

In this imaginary scene, engraved from a painting by Thomas Ford, Henry Mackenzie sits on his host's right. Partly Christopher North leans over the shoulder of poet George Crabbe. Next come John G. Lockhart, William Wordsworth, and critic Francis Jeffrey. Sir Adam Ferguson faces Scott; painters Allan and Wilkie stand, and Constable, Campbell, and Moore sit, left to right.

Retina.com Archive



tapestry work. Glamis was also the birthplace of Britain's Princess Margaret Rose.

From Glamis we motored to Aberdeen, where young Byron spent his early boyhood and attended school. It was a holiday, and courting couples strolled on the cobbles of the six-centuries-old Brig o' Balgownie over the River Don, unchanged since the poet's day. Byron later recalled a gloomy prophecy that the bridge would collapse under the weight of an only son and an only foal:

Brig o' Balgownie, wight is thy way;
Wi' a wife's ae son on a mare's ae foal,
Down shalt thou fa'.

Byron mentions the old bridge in *Don Juan* and adds in a note:

"I still remember, though perhaps I may misquote, the awful proverb which made me pause to cross it, and yet lean over it with a childish delight, being an only son."

But the River Dee, not the Don, nearly ended the life of the youthful poet. At the Linn of Dee near Braemar the water rushes,

With tumbling and rumbling
Among the rocks round,
Dewalling and falling
Into that pit profound.

And here young Byron, tripping on some heather, would likewise have fallen in but for the frantic clutch of an attendant.

Pageant Honors Bruce's "Magna Carta"

Arbroath's historic pageant was a fitting climax to our tour. This spectacle has taken place for the past 10 years in the magnificent setting of the ruined Abbey of Arbroath, 16 miles northeast of Dundee (pages 484-5).

One of the greatest scenes from Scottish history is re-enacted: the meeting of Robert the Bruce and nobles of the realm at Arbroath in 1320, six years after their defeat of the English at Bannockburn, to declare Scotland's independence. That day's proud document was sent to the Pope at Avignon, sealed by the "barons and freeholders, with the whole Commons of the Kingdom of Scotland."

In this Scottish Magna Carta the adherents of Bruce sought support from the Pope, hoping he might prevail on Edward II of England to recognize Scottish claims to independence. Eight years later, Scotland was free.

This great declaration, which Sir Walter Scott describes as "worthy of being written in letters of gold," carries a message of supreme importance for the world today. It is en-

shrined, yellow with age, in Scotland's hall of records, the General Register House at Edinburgh. In it occur the ringing phrases:

"We fight not for glory nor for wealth nor honours; but only and alone we fight for freedom, which no good man surrenders but with his life."

With a full moon riding over the old red ruins of the abbey, we watched the splendid pageant unfold that August evening.

A beam of gold stabbed the crowded darkness of the nave, lighting for its thrilled spectators a warrior in silver mail in a niche high above the altar. He spoke the Prologue. It was the year 1296 and Scotland groaned under the tyranny of Edward I.

Scotsmen Relive Historic Day

Then the scene changed to that great day of April 6, 1320. In their colorful robes the Abbot of Arbroath, Bernard de Linton, followed by the Bishops of St. Andrews, Aberdeen, and Dunkeld, paced up the nave.

King Robert took his place on a dais. One by one his barons came forward and affixed their seals to the great charter, which was to make its long journey to France and light a torch in Europe that has never been put out.

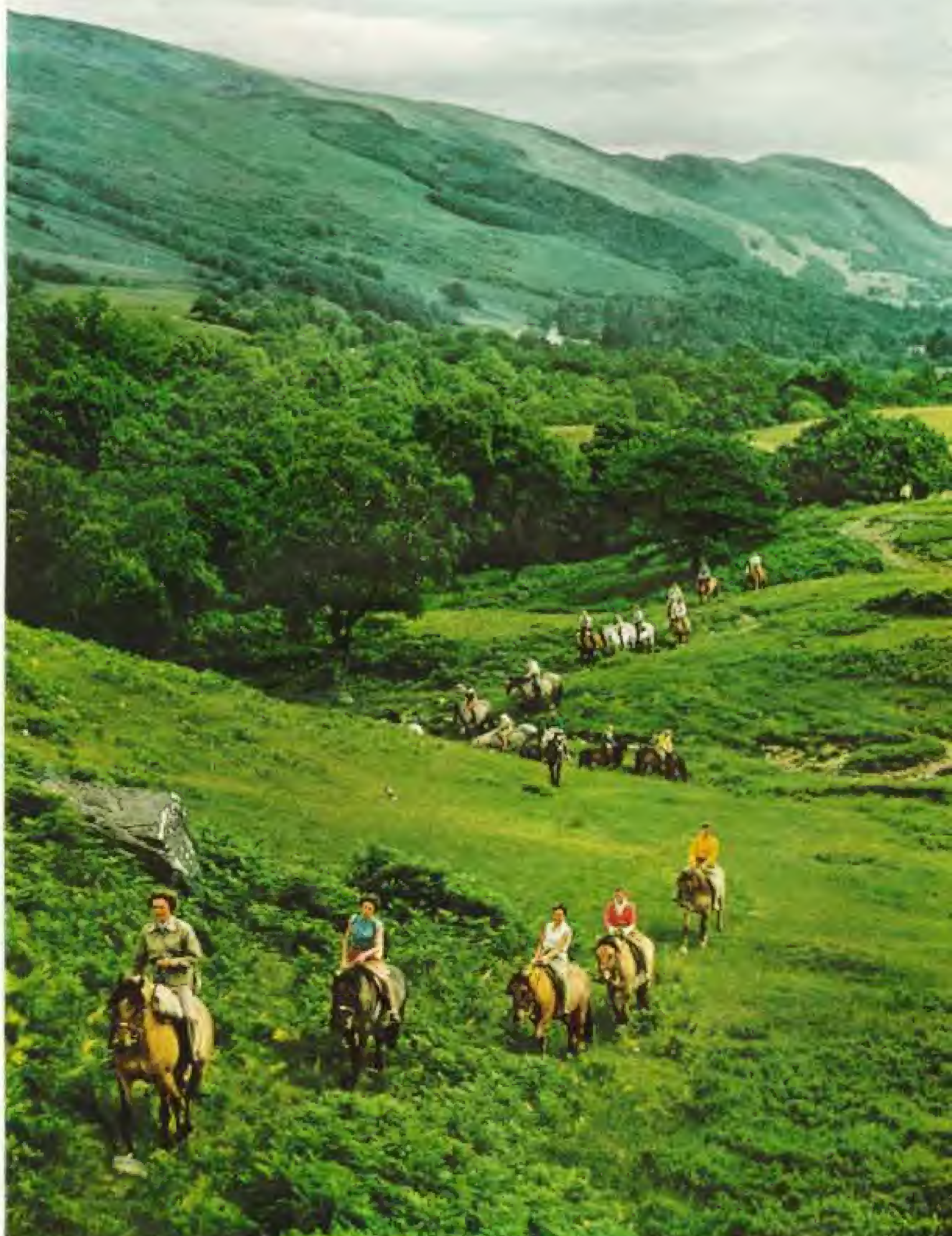
It was done. Darkness again filled the ruins. A monk bearing a lighted torch crossed the nave. His light flickered up narrow stairs in the south wall. Soon he reappeared high overhead at "Arbroath's O," an empty circular window space, and plunged the burning torch into a cresset—an iron vessel filled with oil—such as used to blaze out over the North Sea to guide mariners home.

The cresset flared into life, and a great glow of flame crackled skyward. It was the Light of Freedom, Scotland's message to the world. In the ringing words of her 14th-century historical poet John Barbour:

A! Fredome is a noble thing!
Fredome mayis man to haifi liking;
Fredome all solace to man gifis,
He levys at ese that frely levys!

Freedom makes a man happy, Barbour was saying in his Middle Scottish dialect. Freedom gives solace to man. He lives at ease who freely lives!

For other pilgrimages to the homes and haunts of great British writers, see, in the NATIONAL GEOGRAPHIC MAGAZINE: "Landmarks of Literary England," by Len A. Borah, also illustrated by Miss Revis, September, 1955, and "Lake District: Poets' Corner of England," by H. V. Morton, with photographs by David S. Boyer, April, 1950.



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Pony Trekkers in the Rob Roy Country File Through a Verdant Glen

"The eagle, he was lord above, and Rob was lord below," Wordsworth described the half-freeboater, half-police-man who made this mountain kingdom his own. These riders fan out on a daylong trip from their base at Aberfoyle.

Next two pages: "Mountain and meadow, moss and moor," Scott's lines from *The Lady of the Lake* describe the region. Loch Ard opens a silvery vista to distant Ben Lomond. Heather tints the foreground.









Scotland Celebrates the Birth of Her Charter of Freedom

Pageantry unfolds amid the ruins of Arbroath Abbey. The time portrayed is 1320, six years after Robert the Bruce won victory at Bannockburn and secured the throne of Scotland.

Bernard de Linton, the Lord Abbot of the Abbey, signals with his quill for the Barons of the Realm to affix their seals to the Scottish "Declaration of Independence."

"We fight not for glory nor for wealth nor honours," says the Declaration, "but only and alone we fight for freedom, which no good man surrenders but with his life."

Addressed to the Pope, the document appeals for help against the English king, "that he should leave us in peace in our little Scotland, since we desire no more than is our own, and have no dwelling place beyond our borders."

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← A Knight Advances to Swear Fealty to King Robert

Flanked by Lords Douglas and Randolph, the sovereign sits enthroned on his dais. The Royal Standard and the Saltire of St. Andrew hang beyond.

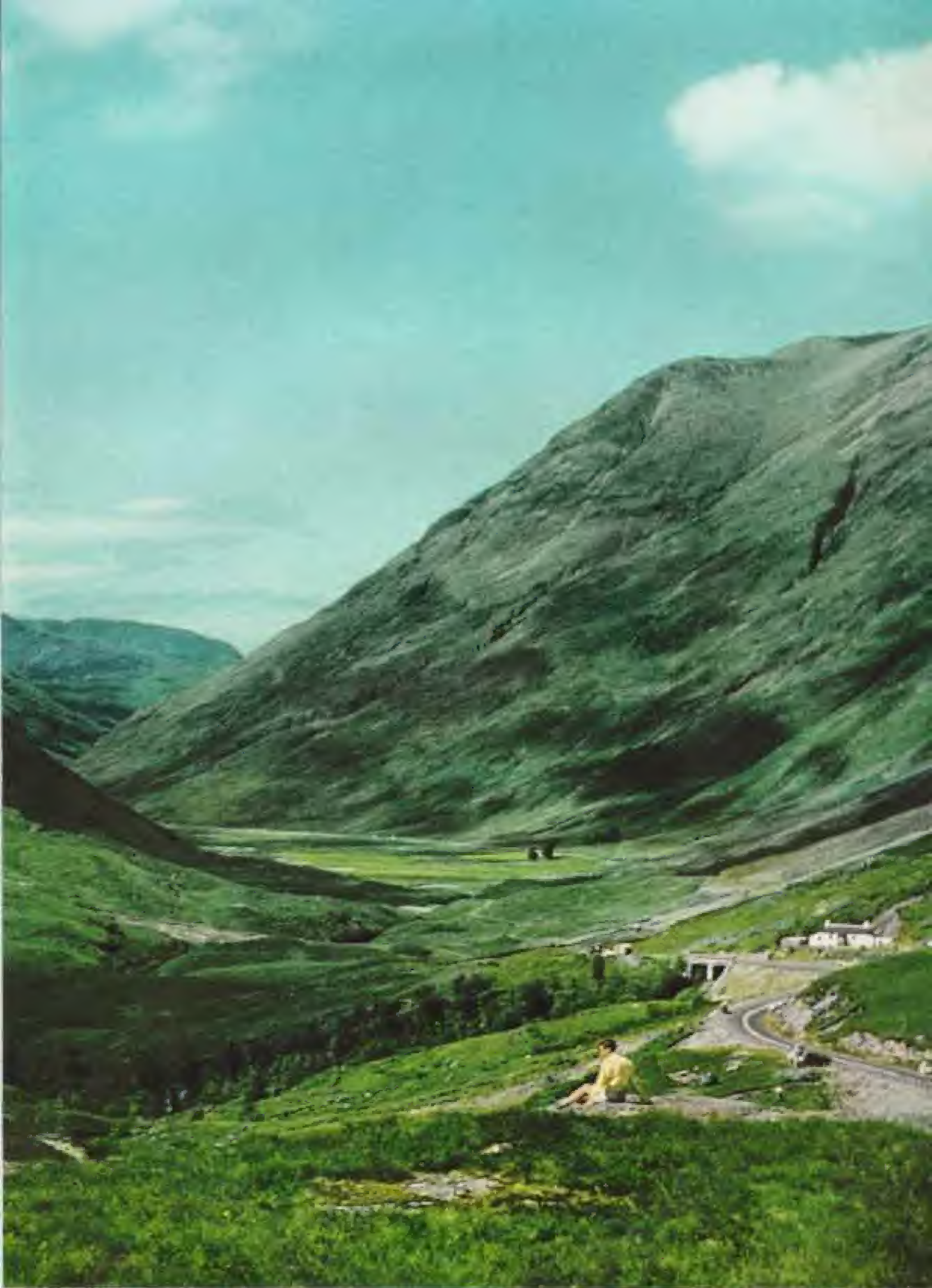
→ After the last seal has been fixed to the parchment, abbot and king read it together. "For so long as a hundred of us are left alive, we will yield in no least way."

About his neck the abbot wears a reproduction of the Monymusk Reliquary, a hallowed Scottish religious relic.

The pageant ends when a monk carries a lighted torch to a high circular window space and plunges it into a vessel of oil, lighting a flame symbolic of the Light of Freedom.









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† Window in Thrums Looked Out on "*Things Happy and Mournful*"

Through a number of novels Sir James Barrie immortalized his home town of Kircubright, County Angus. In *A Window in Thrums* he lovingly details the life stories of Henry, a simple weaver; Jess, his invalid wife; and their children.

"This is Jess's window," he wrote. Here "she sat for twenty years or more looking at the world as through a telescope...."

"Jess's window was a beacon by night to travellers in the dark, and it will be so in the future when there are none to remember Jess. There are many such windows still...."

Children play ball before a whitewashed cottage such as Barrie described in his novel.

← Two Fair Maids of Perth Suggest the Scott Novel

Sir Walter wrote *The Fair Maid of Perth*, a tale of the 14th century, around the irresistible "Catharine, or Katie, Glover, who was universally acknowledged to be the most beautiful young woman of the city or its vicinity." Her charms led jealous swains to treachery and battle.

This house in Perth has been identified as Katie's.

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Ponderous, Strong, Skillful—and Ticklish—the Mighty Pachyderm Serves Southern Asians as a Four-footed Jungle Bulldozer

By M. D. CILATURVEDI

I HAD shot a cattle-stealing tiger in the forests of Uttar Pradesh in northern India. Now, determined to put it out of its misery and to end forever its marauding career, I was trailing the wounded beast.

"Sir," said my mahout from his perch above our elephant's ears, "search however much you like, your tiger is just not in this jungle."

The words had scarcely left his lips when the tiger landed on the elephant's forehead, so close that the mahout could have whacked it on the skull with his goad. He did not, however. With an enviable grasp of the obvious he declared:

"Sir, the tiger!"

Shot in Air Saves Author and Mount

It was an impossible shot. I had a far better chance of killing my elephant than the tiger. Feeling nevertheless that some sort of action was called for, I raised my rifle and fired into the air.

With a convulsive leap the tiger disembarked and evaporated into the jungle. The next morning we found him by the Sarada Canal, dead. His previous bullet wounds had finally brought him to earth.

In my 30-odd years of living and working with elephants as an officer of the Indian Forest Service, I have more than once had to share my mount with a tiger. But on such occasions I have been almost as afraid of my elephant as of our uninvited guest.

For even the staunchest elephant, with a tiger clawing at its flanks, will bolt. And when a four-ton steam roller like that decamps, a rider may well prefer to jump off and take his chances with a mere cat. To a frightened, fleeing elephant, obstacles mean nothing, and neither does the party on its back. If a thorny overhanging branch happens to delete its passengers—well, so much the better for a speedy getaway.*

I met my first elephant in 1924. Just down from Oxford, I had joined the Indian Forest Service and was posted to the forests of Gorakhpur. Ancient tradition holds that in these tranquil woods Buddha, having attained

nirvana, died some 25 centuries ago. But for me serenity was not so easily come by.

Before the days of the jeep, in the wilds that lay beyond the back of beyond, one had to carry all the necessaries along or go without: not for love or money was anything obtainable in the interior. A forest officer's camp equipment in those days made an elaborate kit—tents, stores, lanterns, kerosene, medicines, even such items as needles and thread, wicks and matches. And these had to be guarded vigilantly against such camp robbers as deer and antelope.

The camping season lasted for eight months of the year; the remaining four monsoon months, too wet for movement in the jungle, were spent at headquarters.

The initial lap of my maiden journey from Gorakhpur to the base camp at Pharenda was taken by rail, a whimsical narrow-gauge train that would stop at any point along the way at the convenience of the forest officers. No one bothered much about schedules. In fact, when the train arrived for once at the appointed hour and a passenger congratulated the stationmaster, he blandly replied:

"Mere coincidence, sir. The train was due here yesterday at this time."

Beautiful Bud Meets the Train

At Pharenda the forest ranger greeted me, shifted my gear to bullock carts, and presented me to my mount. Spick and span in its departmental harness, the elephant loomed up a good bit larger than life. Her name was Sundar Kali, or Beautiful Bud—as incongruous a title, I thought, as a pachyderm ever bore.

The problem which promptly suggested itself to me was: How do I get up there? Elephants dislike sitting down; the posture is most uncomfortable. And forest officers can't lug ladders around.

* For other articles on the elephant see in the NATIONAL GEOGRAPHIC MAGAZINE: "Africa's Uncaged Elephants," by Quentin Keynes, March, 1931; "Nature's Most Amazing Mammal," by Edmund Heller, June, 1934; "Working Teak in the Burma Forests," by A. W. Smith, August, 1930; and "Tiger-hunting in India," by Brig. Gen. William Mitchell, November, 1924.

The mahout seemed to have no trouble. He just caught hold of the elephant's fanlike ears and flipped himself up, or, if he wished to be more formal, he would persuade the elephant to make a step of its trunk and waft him topside. Sounds easy, but the elephant must know one well to oblige.

I had to mount the elephant from behind. My orderly twisted its tail into a kind of stirrup—a tricky business—and up I scrambled. We were off, on one of the most harrowing rides I have ever lived through.

Unlike a horse, an elephant seems to sway in all directions at once. I found the gait uneasily reminiscent of a ship's pitching and rolling in a storm. Long before that first three-hour jaunt was over, I felt as if my back had been split and my stomach turned inside out.

The elephant can neither gallop, nor canter, nor trot; it can only walk. Its cruising speed is about four miles an hour. It can charge

at a 20-mile-per-hour shuffle, but only for about 50 yards. While lumbering along it is amazingly sure-footed and rarely stumbles; it feels out soft ground with its trunk and may refuse to go forward for fear of getting bogged.

I learned quite a bit in that otherwise monotonous trek across the flat grasslands. It was an education, for example, to see how the mahout steered his animal.

Elephants Steered by Their Ears

Briefly, an elephant is driven by its ears. Sitting on its neck, the mahout presses with his knees, his toes, or his heels upon the elephant's ear fans or shoulders, conveying precise orders in a subtle, quite uncanny fashion. With no words at all, he can make his mount amble forward, wheel right or left, pick up things, go into reverse, break an interfering branch, kneel, salute, stop, look, or listen.

The mahout uses his goad more for em-

Mighty Tuskers, Butting in Unison, Roll a Three-ton Log Through the Assam Forest

E. P. Cox





Stacking Railroad Ties, a Work Elephant Uses Trunk and Tusks Like Pincers

phasis than maneuver. Mortally afraid of this short, sharp-pointed iron weapon, the elephant will often stop balking and hasten to obey if it so much as glimpses the rod.

The mahout's spoken commands are few, simple, and surprisingly uniform. Some two dozen terse orders make up the entire vocabulary, and, despite the profusion of languages and dialects that characterizes India, they are common to the whole subcontinent, subject only to minor variations in accent.

Many things I garnered that day from the mahout, and many more I acquired during the next quarter of a century of work in Uttar Pradesh. During all this time the elephant was my principal means of transport and often my sole companion in hunting. In my last five years of service as Inspector Gen-

eral of Forests, I had even wider opportunities for observing the elephant throughout India, not only at work and on tiger hunts, but also roaming wild in remote jungles.

Females Lead Nomadic Herds

The wild herds of India are found chiefly in forest areas of Mysore, Madras, Kerala, Orissa, the northern part of West Bengal, Assam, and Uttar Pradesh (map, page 496). The Indian elephant has a great fondness for bamboo scrub and for grassy plains dotted with *Ficus* trees. Gregarious, it marches in herds of 5 to 50 from forest to forest, seldom staying in one for more than a few days.

Except for a short siesta at noon and a brief spell of sleep around midnight, the wild elephant feeds almost constantly. It goes to



Tiger Hunters Ride Elephantback Through the Grass Forests of Cooch Behar

Riders sway and dip in the howdah, a high box saddle. Movie director John Huston holds rifle ready as the party approaches its prey. Pictures on these two pages were among the last taken by Ylla Kottler, Austrian-born photographer. A few weeks later she died in a motor accident while filming a bullock race in India.

water usually twice a day, about sunrise and sunset. On the trail, females invariably lead the herd, with the tusked lagging behind unless alerted to some approaching danger.

Elephants Eat Gargantuan Meals

Working elephants, of course, can't be given as much leisure to feed as they require. Their normal labor stint is five to six hours; then, if they are timber-extraction elephants, they are loosely hobbled and freed to forage in the jungle.

In addition, they receive daily rations. In Uttar Pradesh we allow a full-grown elephant 16 pounds of wheat flour, about a pound of crude sugar, 4 ounces each of salt and butter,

plus 300 to 600 pounds of roughage (bamboo, grasses, *Ficus* branches, or sugar cane).

Elephants do about as well as schoolboys when it comes to holidays. In Mysore and Madras they get three months of summer vacation; in Uttar Pradesh, four. What's more, they don't have to work on Sundays or national holidays.

Rounded up by their mahouts at dawn, the working elephants get their morning meal and bath and are ready for the day's work by 10 o'clock. For timber extraction, each elephant reports for its particular job and takes its place in an amazingly well-coordinated operation.

Some haul logs through rough, muddy ter-

rain, actually helping to knot the dragropes, too. Others drag, carry, or push the logs down the forest slopes. Others load them onto trolleys, a tough and trying job usually entrusted to big tuskers that can balance the logs like matchsticks between tusks and trunk (page 491).

Some of these logging elephants are unbelievable in their working efficiency. Once I met a blind elephant called Kumbhi, who collected logs rolled down the hill by other elephants and placed them on the bank in neat lots of 20. She separated each lot from the other by precisely the same space—the length of her own body.

The tuskers that load logs on the trolley must pyramid them correctly: with small logs, four at the bottom, then three, two, and one; larger logs, two on the bottom, one on top.

400-pound Bengal Tiger Is a Featherweight Load for the Powerful Elephant

Unlike the Indian lion, whose bravado led to its virtual extinction a century ago, the cautious tiger holds its own. Some Indian states appeal to sportsmen to kill man-eaters. One beast carried off 50 villagers.

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Yhs. Galtmanette

Another elephant shunts the little wheeled cars into position, pulls the chains tight around the logs, and pushes the loaded train down the yard without any help from an engine. Note that he pushes the train, and quite gaily, too; he wouldn't pull it for anything—these huge creatures have an ingrained fear of the unknown at their backs.

Tusks Do the Heavy Work

Elephants come equipped by nature with sweat glands; yet they dislike heat and much prefer to work during the rains and cooler weather.

I don't mean to imply that elephants are slack or temperamental workers. Not at all. With very few men about, they tackle their assigned jobs ungrudgingly, with no clock-watching and no breaks for lunch or a smoke.





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Wild Elephants, Stampeded by Drums and Guns, Charge Down the Kabbani River

To replenish the ranks of work animals, herds are rounded up periodically in parts of India and East Pakistan. Unlike the seldom-tamed African species, the Indian elephant is widely domesticated.



Frightened Beasts Rush Toward Captivity. A Camouflaged Corral Lies Ahead

Hundreds of hunters engaged by the Mysore Forest Department spent weeks nudging this herd toward the trap. Massed on the far shore, the men maintained a constant din. Mahouts aboard tame elephants led the pursuit.

They know their jobs and perform them with right good will.

Many people still cling to the notion that the elephant relies mainly on its trunk in doing such chores. Nothing could be further from the truth.

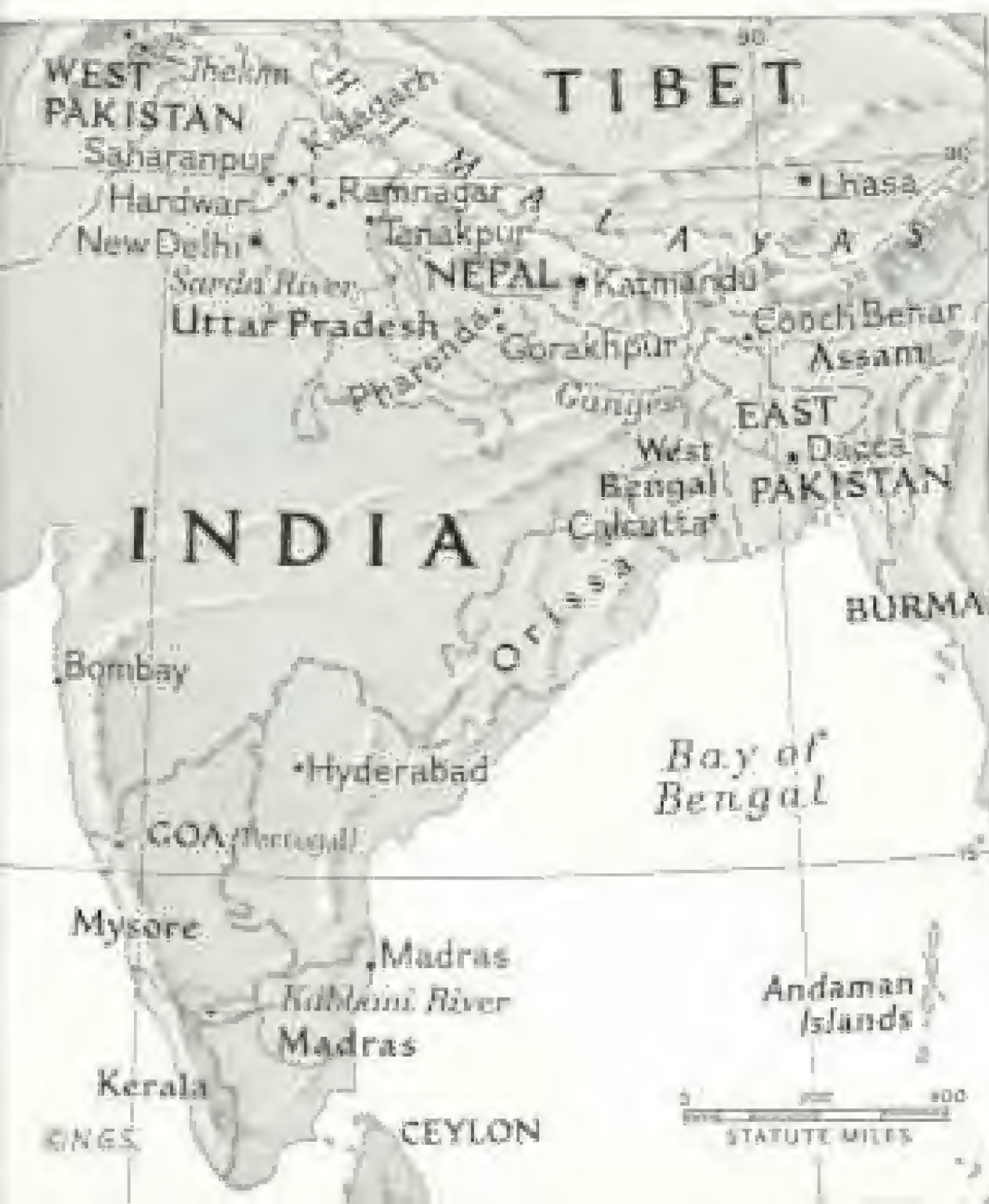
The elephant's trunk, an elongation of the nose and upper lip, is too delicate an organ for it to risk damaging. Lined with extremely sensitive nerves, the trunk not only serves to convey food and water to the mouth, but, just as important, accounts for the highly developed sense of smell. Faced with danger, the elephant will always curl back its trunk and keep it strictly out of the way.

In lifting logs, the elephant uses its tusks instead; in pushing, it is careful to keep the pressure high up at the base of the trunk, about a foot below eye level. The trunk is used only for such relatively light tasks as breaking branches, tightening knots, and lifting small objects from the ground.

Animals with a keen sense of smell, such as dogs, deer, or horses, tend to have heads shaped so that the nose is carried well forward of the body. The elephant obviously has a marked advantage here. In fact, its power of scent is among the sharpest in the animal kingdom.

Wild Elephants Roam Seven Indian States

Herds inhabit forests in Madras, Mysore, Orissa, Assam, Kerala, Uttar Pradesh, and West Bengal. Others live in Ceylon, Burma, and East Pakistan.



An elephant's hearing is not so sharp as the size of its ears might indicate, yet is fairly good. Its range of vision is limited—a fact which sometimes can be most helpful to its rider. Once when I was hunting a man-eater in the Kalagath Forest, my elephant Bijli (Lightning) alerted me to the presence of the tiger long before we could actually see it. Bijli smelled it from a distance and warned us by emitting a peculiar sound from her trunk.

Yet it took hours of tense stalking before the tiger ever emerged from cover—and everyone saw it but Bijli. She stood as firm as a rock, with no sign of nerves whatever, and gave me a perfect shot.

Elephant Third on IQ List

Is an elephant intelligent? Well, yes. But let's not exaggerate its mental powers. The late Dr. William T. Hornaday, former director of the New York Zoological Park, made an exhaustive study of animal behavior, and he placed the Indian elephant third in his list of the 10 most intelligent animals, outranked by the chimpanzee and the orangutan, but ahead of the horse, beaver, lion, grizzly bear, pack rat, mountain goat, and dog.*

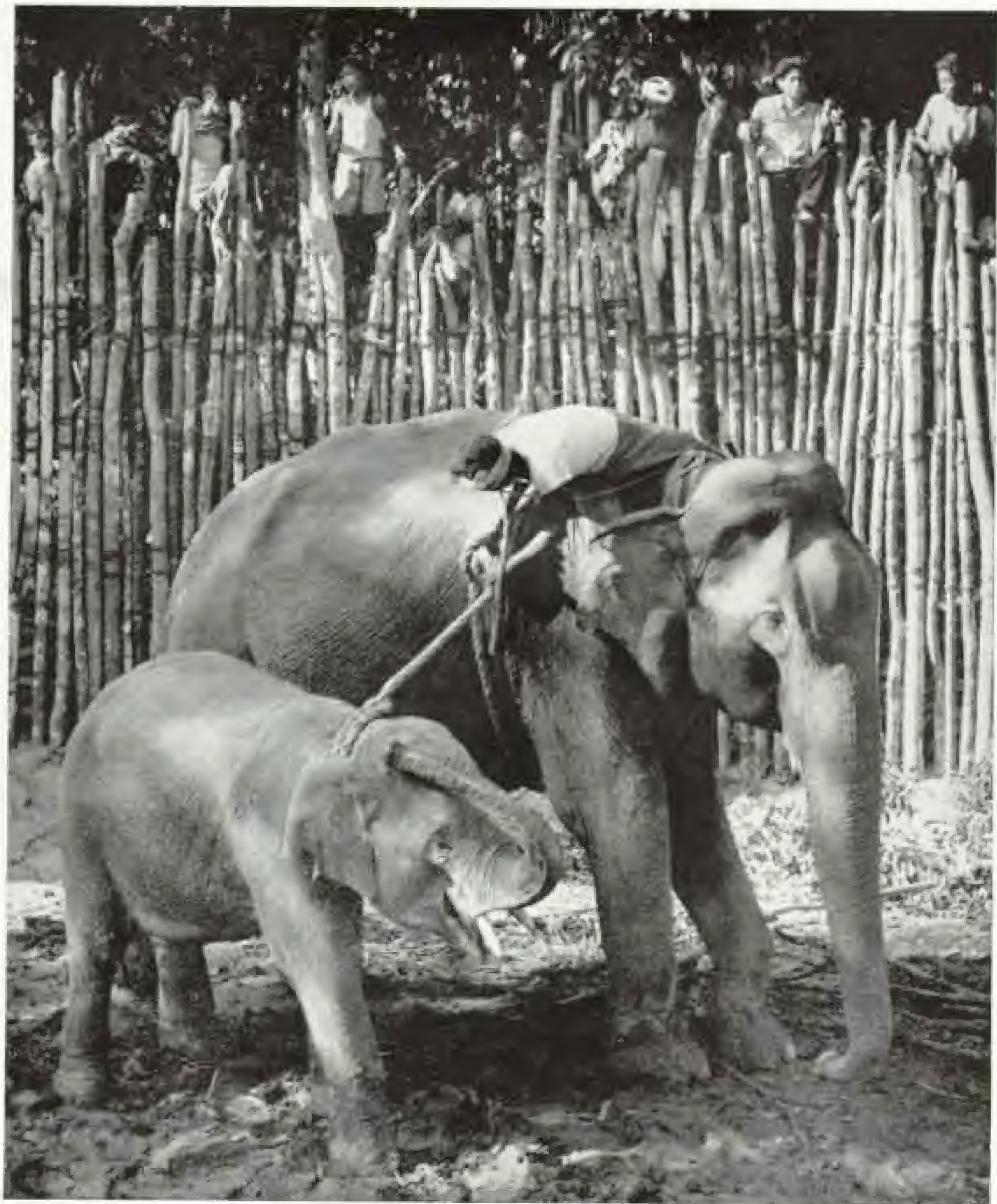
From my experience, I would say that the elephant shows little evidence of reasoning; yet I know it to be gentle and patient, quick to comprehend, ready to obey, and willing to learn. As to its memory, the subject of many a farfetched fable, and its talent for paying old scores, I can only say that such stories strain my credulity.

I have known only one elephant, in fact, that did recognize its own name. I remember being present as a young officer at a roll call of elephants. As each elephant's name was called out, the beast lifted its trunk, as if to say, "Present, sir." I came away much impressed—until I learned that it was the mahouts who were instigating the salutes. The single exception was a male elephant named Shankar that would actually come shuffling up when called.

Another young elephant, grandly named Raja Bahadur (Brave King), was trained to place garlands around the necks of distinguished visitors with unerring sense of protocol. It garlanded both myself and my wife and then welcomed us by raising its trunk.

Most elephant tales of memory and revenge stem from the imagination of mahouts, and

* See *The Minds and Manners of Wild Animals*, by William T. Hornaday, Charles Scribner's Sons, 1914.



Mahout Nooses a Young Captive as Spectators Perch on a Stockade Platform

Tame elephants help bind their wild brothers to stakes. This prisoner struggles to reach the galling lasso with its trunk. One man was killed during the drive; the toll often runs higher.

with good reason. My own mahout, for instance, told me a wonderful story of an elephant that caught sight of its keeper stealing its bread and hiding it under his turban. At the very first opportunity the elephant snatched turban and bread, and ate them both.

The point which my mahout wanted to impress upon me was that he would never dare steal the elephant's food, that an elephant is quite capable of defending itself, and that it was unnecessary for me to observe our standing orders requiring elephants to be fed



only in the presence of commissioned officers. Needless to say, I was not impressed. Yet I admit that elephants sometimes exhibit behavior that borders on memory or reasoning.

Bel Kali Wins Her Way

I was riding back to our resthouse late one evening when, unaccountably, my elephant Bel Kali stopped dead in her tracks.

"*Mal agat!*" shouted my mahout. "Forward!"

Bel Kali refused to budge, and the mahout ominously picked up his goad.

"No, don't," I cried. "See if she will go back."

Shrugging, the mahout commanded, "*Chal!*"

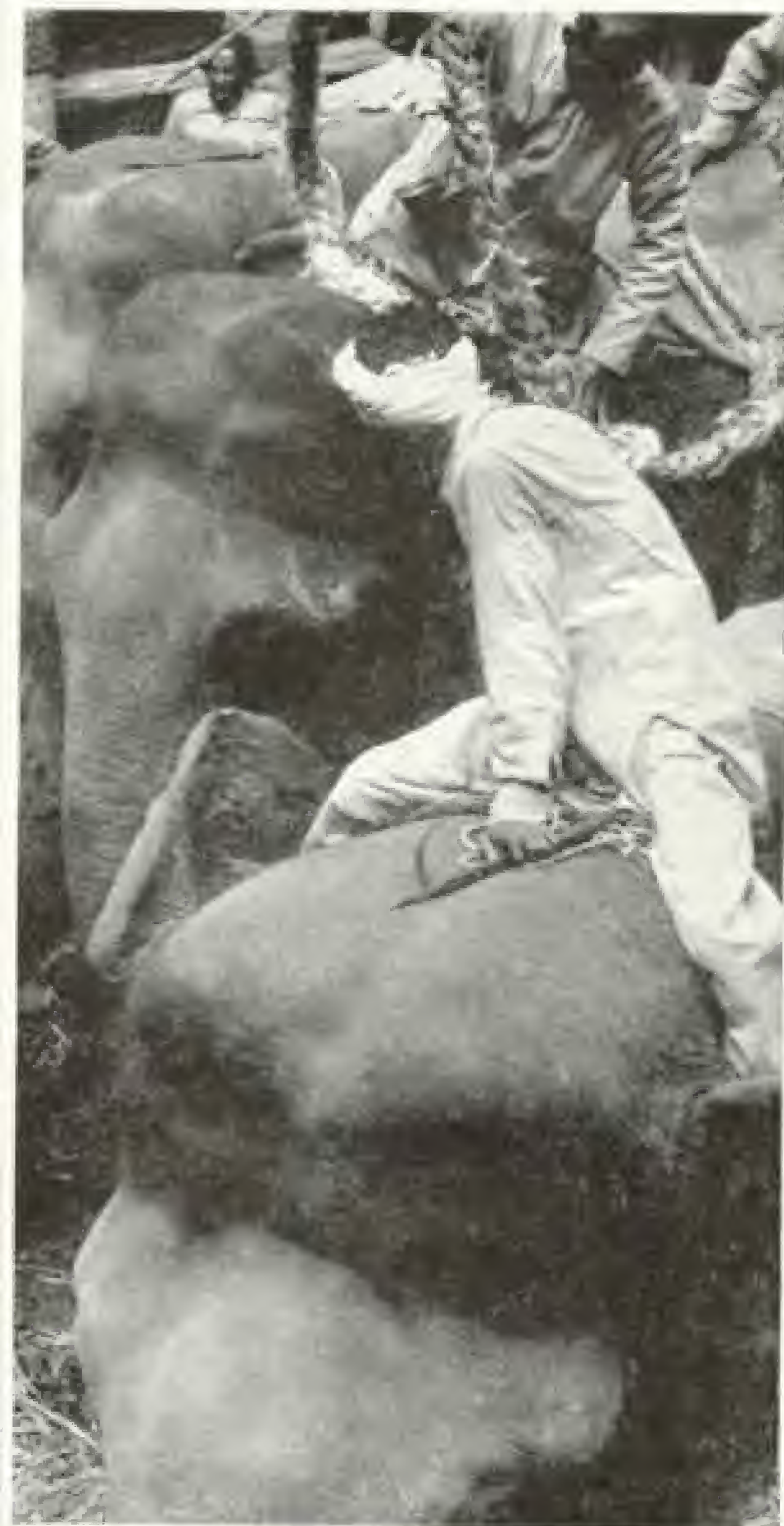
Sure enough, the elephant turned around and marched back down the trail.

The mahout was outraged at my letting Bel Kali have her way. "Sir, this is the surest method of ruining this elephant! Besides, at this rate, we cannot hope to reach the resthouse, ever."

But we had gone only a few yards when we discovered what Bel Kali had on her mind. There on the road lay my raincoat, which had slipped down her back. Bel Kali politely picked it up, passed it to me, wheeled, and ambled homeward.

My mahout didn't know which way to look.

Some elephants have foibles all their own. I once met a young mount in Orissa which



was frightened to death of anything that stirred in the forest, even the lowliest jungle fowl. In fact, it would refuse to move unless someone walked in front of it.

I found this somewhat disconcerting one day when I was tracking a tiger I had wounded the night before. As we pursued the blood trail, I had to act as a buffer for the elephant, instead of the other way about. When at last we located the man-eater in a thicket, it was up to me to lead the elephant to the attack, hopeful that my friend on its back could get in a decisive shot.

We were lucky. It turned out that my bullets the previous evening had smashed the tiger's backbone. Otherwise the tiger, and not I, might well have told this tale.

Battle Royal Ends in a Draw

In their wild state elephants have neither the desire nor the need to tangle with tigers, except to protect their calves. I know of only one fight in my territory in which man was not the promoter. A tusker foraging in the Sarda River islands off Tanakpur blundered upon a tigress at her kill. She pounced upon the intruder, and her mate soon joined the brawl. The affair ended, one might say, in a draw; all three contestants were found dead!

← Trapped! Fibrous Shackles Secure a Female Fore and Aft

Obstinate bulls past training age are set free in the forests. Trainers say cows are mentally more alert and easier to teach.

Trained beasts help push this prisoner into a corral where, noosed and hobbled, she can move but a few inches.

♣ Straining to snap his fetters, a big male lunges for freedom.





I have sometimes read, to my surprise, that elephant herds during calving time maintain an all-night vigil against marauding tigers. Nonsense. It's true that herds with fidgety calves trumpet a good bit in the dark, but this goes on with or without tigers.

At all events, no tiger in its right mind would attack an elephant herd. The fact is that the tiger, unless wounded, will almost always avoid an open fight. If buffalo herds are quite safe from tiger intrusion, elephant herds are doubly so.

I have a good deal of sympathy for the tiger's caution, since I myself once became embroiled with a wild herd. I had been

chasing a tiger near Chila, on the left bank of the Ganges opposite Hardwar, when I heard elephants raising a row on a hillock near the road and impulsively decided to join them.

Rider Mingles with Wild Herd

Commanding my mahout and orderly to keep silent, I worked our mount into the herd, its scent masking our own. The elephants were making such a fuss with their eating, cracking branches and trumpeting, that we were able to circulate and take photographs at will. The herd numbered about forty, with five tuskers and quite a few young calves.

At one point we found ourselves tucked in



between a mischievous, frisky calf and its mother. This struck me as full of explosive possibilities, and I nudged the mahout to move on. To our acute embarrassment, the calf began to follow us and, a few yards farther on, we ran into a second.

Excited and forgetful, my orderly cried out: "Sir, look, another calf!"

That did it. At the sound of this human voice, both calves looked up and trumpeted the alarm; we were unmasked. In no time at all, the whole herd was in a frenzy.

I pressed the mahout's shoulder, giving the signal for "full steam ahead." We vanished under the cover of a heavily crowned tree.

Tame Beasts Drill a Rebellious Rookie Clamped in a Rope Vise

Harnessed, the novice learns through force and example. When his teachers sit, he sits; when they rise, he must rise. If he lags on the trail, they wrench him forward. A mahout astride the captive's neck teaches him to obey commands by pressing feet and legs against the ear fans. Training takes months.

After a few moments I beckoned to the mahout to have our elephant break a branch or two and feed.

It worked. At the snap and crackle of the foliage, the herd seemed to assume that all was well, and soon several elephants stopped trumpeting and began to follow our example and grab a bite to eat. Almost as quickly as it had blown up, the furore subsided.

"White" Elephants Really Light Gray

A myth about as hard to dispel as that of the elephant's phenomenal memory is the belief in white elephants. These light-skinned beasts crop up in Buddhist scriptures. Stories tell of Siamese kings presenting them to courtiers whom they wished to saddle with gifts ruinous to maintain and unthinkable to sell. The monarchs of Burma, too, once boasted of maintaining stables of white elephants, though no reliable witness ever verified their claim.

The truth of the matter is that, while some elephants have much lighter coats than others and are called white, there is no such thing as a pure white elephant.

Another seemingly unsinkable legend concerns that elusive graveyard to which elderly elephants are supposed to repair when their time comes. I remember at least one elephant who appeared to have lost the address. We pensioned off Bel Kali when she reached old age and set her free to spend her last days in peace. In a short while Bel Kali was back again, having walked 50 miles to Ramnagar. Soon afterward she died, never having bothered to seek out the common cemetery, but quite content to be home again.

Ants Help Dead Giants Vanish

The myth springs, no doubt, from the fact that the remains of dead elephants are rarely seen in the forest. In my years of service I have come across only one. So rare are these carcasses, indeed, that some Indian tribesmen believe elephants never die.

Actually, one seldom encounters any dead animal in the forest, thanks to cleanup squads of ants, vultures, jackals, and hyenas, aided

by forest fires and torrential monsoon rains. I have never seen a tiger dead of natural causes, and a dead panther only once. Spotted deer are an exception, for these sometimes die by the hundreds of rinderpest caught from cattle.

Tiger May Land in Elephant Pit

Since elephants are seldom bred in captivity, our work teams must be periodically replenished by additions from wild herds.

The commonest method of capture is by pitting. This calls simply for digging carefully concealed traps, 10½ feet long, 7½ feet wide, and 15 feet deep, across trails often used by wild elephants. Once the animal has fallen, tightly wedged, into the pit, it is extricated by gradually filling up the hole with billets of wood. Then the captive is roped and led away by tame elephants.

Pitting has a number of drawbacks. Although the bottom of the trap is heavily padded with grass and various check pieces to help soften the fall, elephants usually get hurt, sometimes permanently. Moreover, the pit often claims the wrong victims—deer, pigs, even an occasional tiger.

Once, when my friend Shri C. M. Chowdhri, then Chief Conservator of Forests, Orissa, was trying to help an elephant call out of a pit, its

mother charged onto the scene, curled her trunk around Shri Chowdhri, tossed him out of the way, and then lifted her offspring from the trap and departed. Shri Chowdhri, left nursing a broken collarbone and a few cracked ribs, considered he had got off rather lightly.

A more exacting and generally much more exciting means of catching wild elephants is the *keddah*, or drive. I took part most recently in such a drive in December of 1953 in Mysore, where the *keddah* has been refined to an art.*

Noise and Flares Ring Captive Herd

Once the herds had been spotted, beaters spent weeks nudging them step by step into the "surround," a large area in a bend of the Kabhani River. Traffic into the surround was strictly one-way. Except when a herd was being ushered in, the sector was kept sealed by men burning flares day and night and keeping up a constant din.

As soon as all the herds were in and the size of the surround reduced, we were ready to begin the final drive. On the night before, I toured the periphery; the massed elephants were snapping branches, feeding and trumpet-

* See "East Pakistan Drives Back the Jungle," by Jean and Franc Shor, NATIONAL GEOGRAPHIC MAGAZINE, March, 1955.

Shower Bath Rewards a Hot and Dusty Student After a Morning's Schooling

E. P. 4266





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Submerged Bathers Use Trunks Like Snorkels to Suck In Air

To escape the heat, wild elephants keep to shaded areas, moving from forest to forest. They often journey miles to bathe in water holes.

In times of drought, when rivers run dry, elephants exhibit a remarkable talent for locating underground water. Pawing with forefeet, they dig holes two or three feet deep. As water seeps into the cavities, they appease their thirst.

Working animals refuse to labor in the tropic sun without a daily wallow in fresh running water. This crew bathes in a river near Kandy, Ceylon.

Ceylon's wild elephant population has dwindled from an estimated ten thousand a century ago to fewer than a thousand today. Farmers have shot many to protect their crops.

→ Mahouts scrub their charges with coconut husks to prevent thick hides from chafing and cracking in heat and dust.

AND VICTOR LABOY
and MATTHEW DEAN WILLIAMS





† Mother Nurses Her Newborn Calf

Elephants in captivity are seldom allowed to breed. This tame female escaped into the Assam jungle and mated with a wild bull. Recaptured, she bore her calf only a few hours before the picture was taken.

A new calf weighs 160 to 200 pounds and stands two to three feet high. It suckles until it is two or three years old. Mother weighs some four tons; she may consume 600 pounds of fodder a day.

‡ Orphaned Baby Takes Milk from a Tube

Like all elephants, this four-day-old drinks with its mouth, not with the trunk.

Deane Latham, Ltd.



ing away quite as usual, with no apparent thought for the morrow.

With D-day came a number of distinguished guests, including, appropriately enough, Sabu. The "Elephant Boy" of motion-picture fame hails from these parts; he must have enjoyed seeing some of the companions of his childhood grown to full-fledged mahouts and taking part in the keddah.

At a signal from the Maharaja of Mysore hundreds of beaters and some 15 trained elephants started the charge. Tom-toms, tins, and gunshots rent the air. Herd after herd plunged into the river bed and huddled in a frightened mass. Finally a deafening noise at their rear started the leaders downstream, hugging the high bank (page 494).

Herds Tricked into Compound

The trained elephants, or *kaambies*, moved in and maintained the pressure, their armed riders keeping up a fusillade. Trying to get a close-up of the herd, I nearly got shot myself.

As the elephants filed along the bank, they found a well-camouflaged path that seemed to offer a means of escape. Promptly the leaders swung around and followed it, trailed obediently by the rest. When the last elephant had entered the cul-de-sac, the drop gate fell and a great cheer went up: "Victory to the Maharaja!" The wild elephants had

been lured into a 10-acre pound circumscribed by a V-shaped trench 9 feet deep, more than wide enough to deter even the most desperate among them.

The roping of individual elephants now commenced. With the aid of koomkies, the captives were driven in batches of three or four into a circular stockade screened by green bamboo leaves. Jamming into an elephant from all sides, the koomkies held it quite helpless until it was noosed. The victim would struggle fiercely for a while and then as quickly subside and allow itself to be led off.

This may sound simple enough, but a keddah requires an intimate knowledge of elephant psychology, detailed plans, tireless vigil, reckless daring, and dexterous handling. The least carelessness can turn a drive into a disaster. At the 1923 keddah, for example, a tusker charged the roping stockade, smashed it, and sent the visitors perched atop it scrambling for their lives. In 1953 we were lucky, for only one man was killed; at most keddahs the toll is higher.

Elephants Trained by Song in Mysore

Wild elephants of the right age respond amazingly soon to food and water. They never sulk, and it rarely takes more than two or three weeks to break their initial resistance. Elephants more than 30 years of age, however, are considered a bit too old to learn new tricks and are set free. Females between 2 and 15 are the easiest to teach; males are somewhat more recalcitrant.

Training techniques vary in different parts of India. In Mysore the mahouts and their assistants tie the captive to a tree and march round and round him, chanting songs in praise of trained elephants. The trainee soon becomes giddy in its efforts to follow the circling men and stops fidgeting. At once a mahout jumps on its back, then off again.

This curious process goes on for a good three months before the elephant at last accepts a mahout as a rider. Then it is taken for short walks, tied to a koomkie on either side. After about a month the mahout can take the elephant out alone.

The rest is easy. Sitting on the elephant's neck, the mahout teaches it to obey commands accompanied by certain pressures of his legs and feet. The elephant learns the mahout's special smell; in the beginning, at least, it will accept no other rider.

In Orissa and Assam the mahouts skip the

elaborate procedures of Mysore and get directly onto the elephant's neck, whether it likes it or not. Harnessed to two koomkies, the wild elephant can't object very effectively. The mahout jabs his goad into the trainee's head and orders it to sit, the koomkies obey and pull their charge down with them, and the novice soon learns (page 500).

White Enrages Berserk Tusker

Though generally tractable, even trained elephants can sometimes go berserk; an oily discharge from glands at their temples betrays their condition—if, indeed, their irritable, almost insane behavior has not already given sufficient warning.

This malady is known as *worst*. Females very rarely show signs of it, nor do most males younger than 20 years. Even among males of the right age, not all turn must, and of those who do, not all go on the rampage. But an elephant that does run amuck is among the most dangerous animals known.

I know of quite a few cases in which a male turned must overnight, killed its unsuspecting mahout, and escaped to the forest. One such tusker in the vicinity of Saharanpur used to hold up passing haycarts and commandeer their contents. Moreover, he had a rooted objection to anything white, apparently feeling this was a color out of place amid the jungle's greenery. Systematically he roamed about, destroying any gate or signboard painted white and killing unsuspecting passers-by.

Once I met this tusker while returning at night to my forest resthouse from our headquarters at Saharanpur. I saw a dense cloud of dust ahead. I thought at first it must envelop a truck, but soon made out the rump of a big bull kicking up dust at our approaching headlights.

Horn Toot Vanquishes Angry Beast

Instinctively I sounded the horn, as if the obstacle ahead were no more than an obstinate road bog, and then shuddered. But instead of running me down, the elephant trumpeted with terror and bolted into the woods.

It is worth noting that this bull, which I had condemned to be shot on sight, soon rejoined his herd and led a blameless life. When six months had elapsed, with only negative reports on his doings, I felt justified in striking his name from those proscribed.



Bound for Field Duty, a Newly Trained Worker Boards Her Roomette with Diner

Tuskless males, called *makhnas*, occasionally succumb to violent attacks of must. I knew one *makhna* that roved the banks of the Ganges, near Hardwar, spreading terror. One night, indeed, he broke into the hut of a buffalo herdsman and trampled his wife to death as she tried to escape. We had to destroy the animal.

Pachyderms Make Prize Patients

Elephants in captivity are prone to a number of diseases, for which their mahouts over the centuries have developed a bewildering variety of medicines. A common ailment is an upset stomach, cured best by a simple change of fodder. Dropsy is more serious. This is an accumulation of water around the neck, chest, abdomen, and legs. Prescription: rest, a change of diet, complete freedom to graze, and protection from cold, heat, and rain.

"Tough as an elephant's hide"—well, an elephant's hide is tough enough, but it is also extremely ticklish and highly subject to

infection. Never touch an elephant's skin softly; it won't make him laugh, but it may make him react rather violently.

Elephants mauled by tigers need patient and painstaking handling. The least carelessness in the early stages can give rise to maggot formation. If applied soon enough, a concentrated solution of permanganate of potash or a 10 to 15 percent solution of Mercurchrome can prevent sepsis.

Sometimes more drastic measures are called for. Maggots had crippled one of my elephants and seemed blithely impervious to most chemicals. At last, by a happy chance, I hit upon the device of stiling them by spraying the wounds with kerosene mixed with an insecticide. It worked, and with the maggots out of the way the wounds healed quickly.

An elephant's feet require a regular check-up. Thorny and rough country can lacerate the sole, and macadam roads will often leave it tender and sore.

I found that elephants made ideal patients.

They seemed to know that I was doing my best to cure them, no matter how painful the process, and they would obediently lie down in all manner of uncomfortable postures, submitting to treatments that must often have been agonizing.

Usually shorter than its African cousins, the Indian male elephant seldom exceeds 9 feet at the shoulder, or the female 8 feet. Oddly enough, as the mahout found out long ago, one can estimate fairly closely an elephant's height by measuring the circumference of its foot and multiplying by two.

An average Indian elephant weighs as much as four tons—about 56 times the average man—yet its brain is only four to five times as heavy as a man's.

Tusks Hollow Near Base

In general, both male and female African elephants boast sizable tusks. In India males have tusks, the females shorter versions, called tushes, 10 to 12 inches long.

The record in India for a tusk is 9 feet 2 inches; the average is less than 6 feet. A tusk isn't as heavy as it looks, averaging some 65 pounds; the upper part is hollow and pulpy.

The gestation period of an Indian elephant was estimated by Aristotle at two years. Scientists now believe it runs 18 to 22 months. Calving takes place throughout the year, often between September and November in India. A new-born calf will weigh from 160 to 200 pounds and stand about 26 to 36 inches high at the shoulder. One calf is a female's normal output at one time, but twins are known to occur.

The life span of an elephant is strikingly similar to a human's; the animal is sexually mature at 11 or 12 years and reaches its prime physical condition at 25. Most (at least of those in captivity) peg out at 55 to 70.

India's wild elephants, thanks to the Elephants' Preservation Act of 1879, are holding their own against extinction. As for the working elephants, I believe it will be many a long day before they are supplanted by tractors and such. An elephant requires no spare parts, no irksome repairs, no diesel oil. Its fuel usually can be supplied on the spot, not imported at great expense and pains

through the wilderness. It can perform many different functions without any change in basic equipment, and its obsolescence and depreciation rate are very low.

When we moved into India's Andaman Islands after the Japanese retreated in World War II, the Forest Department took over a tractor division they had installed for timber extraction. We tried to run it but soon gave up. Compared with our elephant units, it proved quite inefficient.

Land armies of ancient times had an elephant wing, somewhat like the tank corps of today. Alexander the Great, during his invasion of India, gained a great respect for war elephants while facing those of Porus at the Battle of the Hydaspes in 326 B. C., near present-day Jhelum, Pakistan. After Alexander died, his general Seleucus added war elephants to his own army.

Many Romans scoffed at elephants as war weapons. But Publius Cornelius Scipio, the Roman general whose legions fought Hannibal and the famous elephants he brought across the Alps, came to think of them with respect.

Elephants Served Moguls and Maharajas

Elephants were used by Indian rulers of old for transport, as mobile bridges to ford streams, as liveried mounts in royal processions, and as rams to batter the spiked wooden gates of besieged forts; their heads were specially armored for this last purpose.

Elephants have been a coveted prize through the ages. Harun al-Rashid sent an elephant to Charlemagne in 801; and St. Louis of France sent one to Henry III of England about 1255. This was probably the first elephant to reach English shores; a drawing of it is in the library of Corpus Christi College, Cambridge University. In modern times, India's Prime Minister Jawaharlal Nehru has kept up the tradition by sending gift elephants to various zoos to delight children.

In 1608 St. Francis de Sales wrote: "The Elephant is but a great Beast; yet the most worthy of all the rest, and of the greatest sense."

So I have always found it. Long may it continue to roam freely in our forests and dutifully earn its feed working in the jungles of our vast subcontinent!

Notice of change of address for your NATIONAL GEOGRAPHIC MAGAZINE should be received in the offices of the National Geographic Society by the first of the month to affect the following month's issue. For instance, if you desire the address changed for your December number, The Society should be notified of your new address not later than November first. Please give BOTH your OLD and NEW addresses, including postal-zone number,

Beauty and Bounty of Southern State Trees

Dixie's Fragrant Pines, Shiny Magnolias, and Brooding Oaks—Inspiration to Patriots and Poets—Now Yield a Wealth of New Products

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BY WILLIAM A. DAYTON

With Paintings by National Geographic Artist Walter A. Weber

"THE soft green leaves-dangle all around me," wrote Walt Whitman, resting in the rain beneath an oak in Georgia. "The wind steadily keeps up its hoarse-soothing music over my head—Nature's mighty whisper."

Then he acclaimed a near-by tulip tree as "the Apollo of the woods": "Tall and graceful, yet robust and sinewy, inimitable in hang of foliage and throwing-out of limb; as if the beauteous, vital, leafy creature could walk, if it only would."

Years earlier George Washington, touring the Southland in 1791, turned earnestly to a South Carolina lady who planned to fell an oak which, she feared, would limit the view from her new portico when fully grown.

"Mrs. Horry," he said, "let it stay. It can do no harm where it is and I would not think of cutting it down."

Poet and President Saw Glory in Trees

The poet's words ring exuberantly, the President's are plain. But both bespeak a similar emotion, a reverence for nature in one of its proudest manifestations—the trees that rise to rare magnificence in the American South. On the following pages the NATIONAL GEOGRAPHIC MAGAZINE presents 16 paintings by staff artist Walter A. Weber, depicting the trees chosen over the years to symbolize 20 southern and southwestern States.

Editor's Note

In this issue the NATIONAL GEOGRAPHIC MAGAZINE publishes the second of two articles portraying in words and paintings the State trees of the United States. The first article, describing northern State trees, appeared in November, 1955.

With trees of the South and Southwest, the author here includes the State symbols of Connecticut and Indiana (white oak and tulip tree, respectively), since they are honored also by southern States.

William A. Dayton, author of both articles, entered the U. S. Forest Service in 1910. At his retirement on January 1, 1956, he was Chief of the Division of Dendrology and Range Forage Investigations and the Service's chief botanist. Walter A. Weber, staff artist and naturalist of the National Geographic Society, is world-renowned for his paintings of wildlife.

Mr. Weber journeyed some 25,000 miles to pick out exemplary specimens amid the South's remarkable profusion of trees: North Carolina, for example, can boast many more species and varieties than all Europe. One reason is the South's comparatively long growing season. But even more significant have been geographical factors and the climatic vicissitudes of the last Ice Age.

Glaciers Pushed Forests Southward

On the North American Continent the great glaciers reached little below the latitude of present-day Philadelphia. Trees from farther north retreated into the South, mixing with the trees already there. When the glaciers receded, some of the northern trees stayed on.

But it was a different story in Europe. There the vegetation forced southward by tremendous cold was checked by towering east-west mountain ranges and finally blocked by the Black Sea and the Mediterranean. Many of Europe's trees, including magnolia and bald cypress, were wiped out.

Does this mean that the southern forests today are a jumble of all those migrant trees?

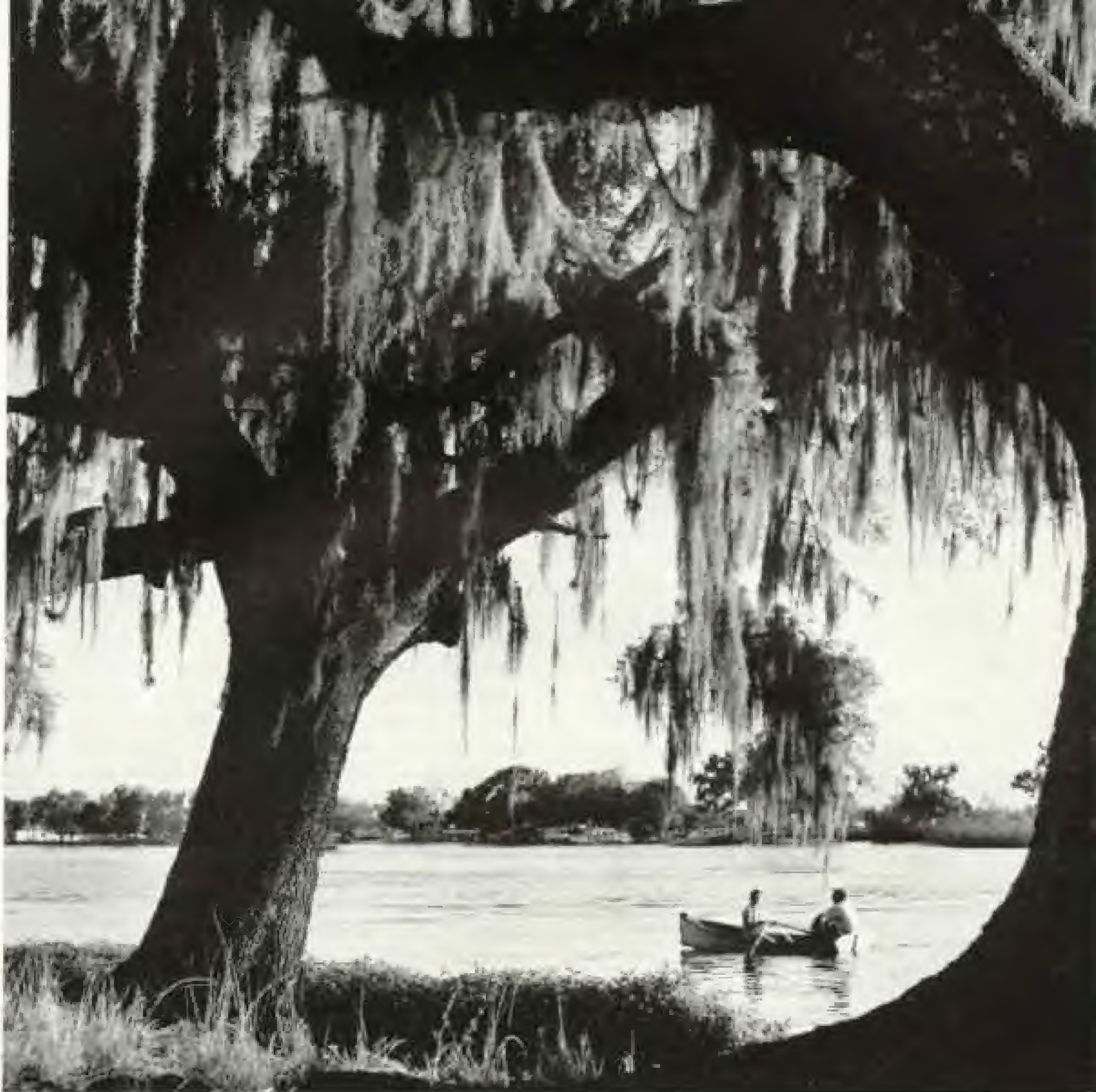
No. Climate and evolution have brought subtle changes, giving the trees a regional character. To visualize this, imagine that we board a helicopter in New England and fly southward, low and slowly.

At first we see hardy evergreen forests of firs, spruces, and eastern white pine, interspersed with sugar maple, birch, elm, and oaks. A little later appears a graceful stranger from the South, the tulip tree, decked with greenish-yellow flowers. Gradually these newcomers become larger and more numerous.

The pines change also. Their needles often are longer, such as the loblolly's. Before long we spot the first longleaf pines, resplendent with needles up to 18 inches.

Southward from Virginia's Dismal Swamp we see live oaks, increasingly broad and majestic. So too the cabbage palms, or palmettos, grow larger as the climate warms.

We first see the palmettos on the southeast-



Live Oaks Whiskered with Spanish Moss Frame a Boat on Bayou Barataria, Louisiana

ern islands of North Carolina, scrubby and only 4 to 6 feet high. In South Carolina they rise 30 to 50 feet. And in Florida, some reach a height of 90 feet, their glossy leaves, shaped like fan ribs, unfolded in full glory. Early settlers cut the white bud from the top of this tree and stewed it in bear oil. Now the bud graces the choicest menus in "heart of palm" salad.

For a close-up of forest contrasts, we might put our helicopter down in a clearing near North Carolina's celebrated Grandfather Mountain.

Here glows a sea of color beneath red spruce, eastern white pine, and gracefully drooping branches of Fraser fir. Flaming

azaleas shine pink and orange. Shades of purple beckon from dense, lacy "rhododendron bells"—so called because a man can get so entangled in them that it is all he can do to get out. Juncos nest here, and if we could stay long enough, in good concealment, we would see bobcat and bear.

Sylvan Giants Rule the Everglades

Our second stop might be in the Florida Everglades, at the edge of the Big Cypress Swamp. Here more than 60 species of trees and shrubs vie for space. Magnolias up to 100 feet high, their deep-green leaves shining as if enameled, shed fragrance next to great oaks and bald cypresses. These trees rise

from hummocks or right out of the water, which is covered with floating fern, rafts of bluish water hyacinth, and gray-green water lettuce. Around some of the larger trees twist strangler figs thicker than a man's arm.

Spanish moss, with painted buntings nesting in it here and there, hangs like thousands of gray beards. It intercepts so much sunlight that the ground is dark, except where a shaft of light slants downward as if through the rose window of a cathedral.

The air is moist. A water moccasin winds by lazily, hardly visible. There's a tapping of the pileated woodpecker, with scarlet crest and black-and-white wings, locally called "Good-God." Now and then a mockingbird trills, and in the distance an alligator moos like an upset cow. But by and large there is silence, a mood of sorcery and magic that has cast deep impressions on men since the days of the early Indians.

Red Men Believed Trees Intelligent

Some Indians believed that trees had intelligence superior to man's. An Iroquois legend tells of a star that fell from heaven and buried itself in the ground; it sprouted into the first pine—tallest of trees, watching the skies forever.

Southern trees also drew admiration from the earliest white settlers and scientists.

"All the Countrey is overgrowne with trees," reported Capt. John Smith, who helped to set up the first permanent English colony in America in 1607.* "Many of their Okes are so tall and straight, that they will beare two foote and a halfe square of good timber for 20 yeards long."

John Bartram, botanist to the King of England, wrote a century and a half later that "no roads is finer to travail than ye carolinas, mostly shaded with lofty pines, oaks, tupelo, or liquid amber [sweet gum]."

Bartram's son William, whose sober travelogues inspired Coleridge to soaring fancies, added: "To keep within the bounds of truth and reality, in describing the magnitude and grandeur of these trees, would, I fear, fail of credibility."

Almost incredible, too, is the variety of roles trees have played in American life. They have provided food, shelter, and beauty. To pioneers they gave often crucial encouragement. They have even saved many lives.

Thus the 16th-century conquistador Cabeza de Vaca relates that he would have starved

to death had he not come upon the nuts of the piñon. He survived, and his report spurred other Spaniards to explore the American Southwest. And the Indians there to this day find a steady food supply in the nuts of the singleleaf piñon.

Paloverde Flowers in Spring Rains

Where greenery might most be missed, in the southwestern deserts, blooms the colorful blue paloverde. Awakened from its leafless state by the rains of spring, it bursts into a shower of golden-yellow blossoms. On the high ground of Arizona and New Mexico thrives the silvery-needled blue spruce.

Most impressive, perhaps, is the soaring coast redwood of California, reaching more than 300 feet into the air and living for more than 1,000 years.

California's Save-the-Redwoods League campaigns vigorously to keep these venerable senior citizens of our forests from having their lives cut short. Probably the finest specimens can be seen from U. S. Route 101, the Redwood Highway. But fossilized remnants of ancient redwood can be found as far east as Maryland.

Consider the more modest but no less dramatic role of the hardy cottonwood. Because it grows so rapidly—as much as 12 feet a year—it gave the pioneers shade, shelter, and firewood where no trees grew before. Today the cottonwood is an important tree in shelter belts planted in the 1930's to stop the wind from carrying off precious soil (page 540).

Preserving the soil, trees also guard against the sudden flooding of rivers, since they condition the ground to soak up water like a sponge. Well-rooted trees, moreover, can be a godsend in a hurricane, breaking the wind and providing something a man can hold on to—or climb up on—to save himself from the wild waters. Of this, some gaunt, twisted oaks in Louisiana teach an awesome lesson.

Deep-rooted Oaks Saved an Island

After four islands near the mouth of the Mississippi suffered through a hurricane in 1856, the men of Grand Isle tended their oaks carefully and planted new ones in strategic places. The other three islands neglected theirs. Then the great storm of 1893 brought a terrible reckoning.

The three islands, almost flat, had hardly

* See "Captain Smith of Jamestown," by Bradford Smith, NATIONAL GEOGRAPHIC MAGAZINE, May, 1957.



Lightning-rod Cables Attached to Trunks Protect Mount Vernon's Stately Shade Trees

This large pecan was set out by the Washington family about 1847. Workmen here string copper cable from a treetop rod to another driven into the ground. Unprotected trees may be shattered when a bolt's passage forms vapors within the wood. For this tree, elaborate care was to no avail; hurricane winds felled it in 1954. Twelve forest trees survive of the many planted by George Washington himself on his Virginia estate.



Seminole Woman Prepares Palmetto Leaves for Holy Week

any trees with deep roots. One woman lived through the flood because her husband tied her hair to the branches of one of the few trees. But more than 1,500 people died in the wind-whipped torrent. These islands have been desolate ever since.

Grand Isle, on the other hand, emerged buffeted but comparatively unwrecked, thanks to its pampered oaks. "There's a law here against cutting down oaks," a Grand Islander told a visitor not long ago, "a law in the heart of everybody. They saved us, and someday they'll save us again."

Live oaks did, in fact, repeat their life-saving role this year when Hurricane Audrey

struck the Louisiana coast some 200 miles west of Grand Isle. Farther inland, great oaks with trunks as much as four feet in diameter were uprooted by the storm, leaving craters as if shells had exploded under them. But many of the lowlier stunted oaks along the coast held on and became saviors in the flood.

Suddenly, hundreds of lives were staked on frenzied efforts to swim or float to an oak. Once there, the hurricane victims anchored themselves with belts or makeshift ropes made of torn clothes. Often they had to fight off fear-crazed nutrias and snakes seeking sanctuary in the same tree. A family of five survived that way until rescuers came. A lone nine-year-old girl hung on for nine hours and one couple for 24. Thus many a scrubby oak once more earned fervent gratitude.

Live Oaks Pay Dues of 25 Acorns

Louisiana's live oaks have a society of their own. To become a member, each tree must be at least 100 years old. Dues

are 25 acorns a year, to be planted where new trees are needed most. President of the Society of Live Oaks is the Locke Breaux Oak near Hahnville, Louisiana, which stands 78 feet high and 168 feet across.

Aside from high sentiment, southern trees also prompt appraisal in dollars and cents. More than half of the land in the South is valuable primarily for its timber, which covers 194 million acres. This is more than a third of the commercial forest area in the entire continental United States. Across this vast domain grow both softwoods and hardwoods—trees that bear cones and trees that wear broad, deciduous leaves. (These widely used

timbermen's terms often mislead: some softwoods, such as longleaf pine, yield lumber harder than such hardwoods as tulip tree and cottonwood.)

Timber is now a billion-dollar industry in the South, ahead of the cotton crop and close to the biggest money-maker, tobacco. City people invest in woodland much as they do in stocks and bonds.

That trees can be as good as money in the bank is nothing new in the South. It's an old custom to plant an acre of pines when a child is born, to help pay for college later on. And in Elizabethan times Sir Walter Raleigh sought recruits for transatlantic expeditions with tales of "trees that yield pitch, tar, rosin, and turpentine in great store."

These products, drawn from longleaf and slash pine, were named naval stores because they were chiefly useful in wooden ships, and the South became the world's greatest supplier. Georgia alone is still tapping some 34 million trees a year. Naval stores find wide employment today, not only as turpentine, pitch, and rosin, but also in the making of soap, plastics, and other products.

Masts Hewn from Lordly Pines

The South in the past also gained rich revenue from trees for shipbuilding. Live oaks by the hundreds of thousands became stout hulls plying the seven seas, and many a mast was hewn from "those lordly pines," as Longfellow called them, "those captive kings so tall." Sir Walter Scott admired "an immense stick of timber just landed from America," because it "seemed like one of the gigantic obelisks which are now and then brought from Egypt, to shame the pigmy monuments of Europe."

Though no longer essential for ships, southern trees find more uses today than ever, most voluminously in the building of houses. Wood pulp is increasingly in demand, too, chiefly for kraft paper to make containers, heavy wrapping paper, and bags.

As a result, huge new pulp-making plants are going up in the South (pages 532-3). Figures of 50 years ago and the present tell an impressive story for the 12 southern States: from four pulp mills to 67; from a pulp-making capacity of 50,000 short tons to more than 13 million; from 2 percent of the national capacity to 67 percent.

Southerners feel that pulp and pulp paper may soon be their largest industry, and no

wonder. Florida tree farming already gains a larger income than citrus growing, and Georgia pines earned more money in one year than Georgia cotton normally does in two.

Scientists, moreover, keep on the lookout for more and more things to be made from wood.* Pulpwood, for example, yields lacquers and photographic film, dyes, rayon, cellophane, fertilizer, explosives, diapers, and bottle caps. From sawdust come linoleum and fiberboard, baking yeast and bowling balls, phonograph records and shells for telephones. Specially hardened plywood provides tubing and machine parts. Strips of laminated wood, pound for pound, can be stronger than steel.

Scientists and foresters also keep striving to do things for the trees themselves (pages 520-1). For example, in a Tennessee Valley Authority tree nursery at Clinton, Tennessee, white pine seedlings are exposed to artificial light at night. This is an attempt to make them ready to plant within a single growing season; at present they need two.

There is also hope of speeding up a tree's growth to two or three times its normal rate, thanks to a group of plant hormones called gibberellins. Promising results have already been achieved at the experimental station of the U. S. Department of Agriculture at Beltsville, Maryland. Other experiments aim to make various species more resistant to insects.†

Fire Ravages "Plantations of God"

In view of these efforts, it is sad that billions of southern trees must burn each year, uselessly. More than three-quarters of all the forest fires in the United States rage in the South. They account for nearly 85 percent of the Nation's timber loss by fire, destroying more than 6,000,000 acres a year! Worst of all, many of these forest fires are believed to be maliciously set.

But fortunately most southerners respect their trees as living things, as friends. Knowingly or not, they look upon the forest a little the way Emerson did: as a "plantation of God" that "with a million spells enchants the souls that walk in pain"; as a place where "a man casts off his years as the snake his slough, and at what period soever of life, is always a child."

* See "Versatile Wood Waits on Man," by Andrew H. Brown, NATIONAL GEOGRAPHIC MAGAZINE, July, 1951.

† See "Our Green Treasury, the National Forests," by Nathaniel T. Kenney, NATIONAL GEOGRAPHIC MAGAZINE, September, 1956.



Shaggy Wigs of Cabbage Palmettos Spike the Sky Above the Florida Everglades

Seminole Indians and backwoods hunters relish the palmetto's terminal bud, a cabbage-like growth atop the trunk. But cutting it off invariably kills the tree. American egrets forage in the shallows.

Cabbage Palmetto, the Seminole Tree of Life

(State Tree of Florida and South Carolina)

WHEN a winter vacationist reaches the northern border of South Carolina, he begins to see the palmettos, like graceful green feather dusters, waving a welcome to the South.

The cabbage palmetto has the widest range of any United States palm. From islands off Cape Fear, North Carolina, it extends southward to Florida. There it spreads out across the peninsula, reaching westward to Panama City and Andrew Bay.

Early European settlers in Florida found the Indians making good use of palmetto trees. The Seminole used the wood, and still use it, to make houses and furniture. They thatched their roofs with the stiff, fronded leaves. They ate the small, plumlike black fruit and also the "cabbage" that grows atop the trunk.

Colonists found that the tall, straight-stemmed tree, which may grow as high as 80 or 90 feet, made durable wharf pilings because it resists teredos, or shipworms.

South Carolinians in Revolutionary times built of cabbage palmetto logs a stout stockade on Sullivan's Island in Charleston harbor. Here, on June 28, 1776, Gen. William Moultrie and a band of volunteer infantrymen defied and defeated the oaken ships of the British. The victory is still commemorated on the South Carolina State seal, which depicts an erect palmetto and an uprooted oak.

A mature cabbage palmetto stands normally

from 30 to 50 feet high, with a breast-high diameter of 18 to 24 inches. Though the trunks are normally straight and uniform, about as thick at the top as at the bottom, coastal trees lashed by sea winds sometimes grow weirdly twisted.

Palmetto bark is chiefly grayish brown. It often has a curious criss-crossed marking, as if encased in lattice work. This is caused by the bases, or "boots," of old leafstalks that have fallen off the tree.

Modern Americans use the cabbage palmetto in as great a variety of ways as the Seminole. When you use a whisk broom or a scrub brush, you may be using fibers from palmetto leafstalks or sheaths. You carry a palmetto frond away from church with you on Palm Sunday. The leaves also go into mats, hats, and other woven objects.

The wood, relatively light and soft, makes fences, canes, and occasionally telephone poles. Cross sections of large trunks are sometimes polished for small table tops.

The tree's scientific name, *Sabal palmetto*, presents something of a mystery. The species was classified and the term "sabal" first published by the French botanist Michel Adanson in 1763; later he was chided for using "bizarre" words in inventing generic names. Perhaps sabal was one of these. In any case, no one knows what it means or why Adanson chose it for the American palmetto.

Honey-rich Flowers Appear in June. The Leaves Adorn Altars on Palm Sunday

Blossoms of the cabbage palmetto grow in curving clusters more than 2 feet long. Individual blooms (upper center) show slightly larger than life size. Fruits are small, plumlike black drupes. New leaves form at the crown of the tree; they are erect at first, then spread horizontally, and finally bend earthward. Leaves may grow up to 6 feet long and 8 feet broad and be split into many pointed segments interspersed with fibers.



Flowering Dogwood Spreads Beauty

(State Tree of Missouri and Virginia)

IN OUR eastern woodlands, flowering dogwood puts on three color shows a year. In spring it presents a dazzling white, as if fresh snow were glittering on its widespread branches; in summer, a bright green; and finally in fall, a fiery red.

Flowering dogwood (*Cornus florida*) is the most colorful of some 20 dogwood species in the United States, nine of them trees and the rest shrubs. It ranges as far north as New York State and southern Ontario, south to Florida, and as far west as Oklahoma and eastern Texas.

It is a small tree, rarely higher than 40 feet or more than 18 inches in trunk diameter. It thrives under tall deciduous forest trees in well-drained soils. The true

Flowering Dogwood Unfolds a Snowy Mantle

✦ Four petal-like bracts frame each cluster of small yellowish flowers. Pale, oval leaves are olive green above, paler beneath. Berrylike fruits, relished by wild turkeys and other birds, are usually shiny red or rarely yellow. Bark, reddish brown to almost black, is checkered with squarish plates like the hide of an alligator.

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flowers of the dogwood are yellowish or greenish and pretty enough, but they are very small, crowded together in clusters of 20 to 30. Each cluster, however, is surrounded by four heart-shaped bracts, 2½ to 4 inches long, looking like large white petals. The total effect is so striking that North Carolina made flowering dogwood its State flower.

Folklore surrounding the flowering dogwood is ennobled by a legend that it furnished the timber for the Cross, and that Jesus, in His gentle pity, gave the tree forever after a slender, twisted shape and bracts in the form of a cross, with nail prints on each edge. This touching story can be only a legend, however. True flowering dogwood did not grow in the Holy Land in the time of Christ.

Since before colonial times in America, the

dogwood has been of use to man. Indians of the eastern United States boiled its bark and gave the medicine to warriors fevered with battle wounds. Early settlers took a similar brew for malaria, and even today, in parts of the South, a few drops of dogwood essence in whisky are often taken as a home remedy. During the Civil War the blockaded Confederacy used dogwood in place of quinine.

Many people know dogwood for its beauty alone, but lumbermen prize its tough, close-grained wood. Today textile mills use dogwood for shuttles, because it is extremely hard and stays smooth under constant wear. Flowering dogwood also turns up in butchers' skewers, golf club heads, tool handles, pulleys, jewelers' blocks, and woodcuts, as well as in charcoal for black gunpowder.

White Oak Stands as a Sturdy Patriarch

(State Tree of Maryland and Connecticut)

THERE are few more majestic sights in nature than a mature white oak. Its massive trunk set like a boulder in the ground, its mighty branches, some as big as trees themselves, stretching 100 to 160 feet across.

Some of the most magnificent specimens of white oak in the world grow on Maryland's Eastern Shore. When the first European settlers arrived three centuries ago, they built their homes in the shade of these trees, already old when they arrived. Perhaps the most famous is the Wye Oak in Talbot County, a giant 95 feet high with a 165-foot spread and a trunk nearly 28 feet around. It is not surprising that Maryland adopted the white oak as its State tree and purchased

the Wye Oak, making it a State monument.

Near Hartford in Connecticut, which also honors the white oak as its State tree, stood the Charter Oak, so named because in 1687 colonists hid the Connecticut Charter in its huge hollow trunk to prevent soldiers of King James II from seizing it. When the tree blew over in 1856, it was estimated by some to be nearly 1,000 years old.

The woodland hiker who likes to identify trees faces a bewildering challenge in the oak. The white oak (*Quercus alba*) is only one of more than 150 species, subspecies, and varieties in the oak genus found in the United States. Some are full-sized trees, some are shrubs, and some may be either.

Baying Hounds Pace Hunters Past a White Oak Set Afire by Autumn's First Frost

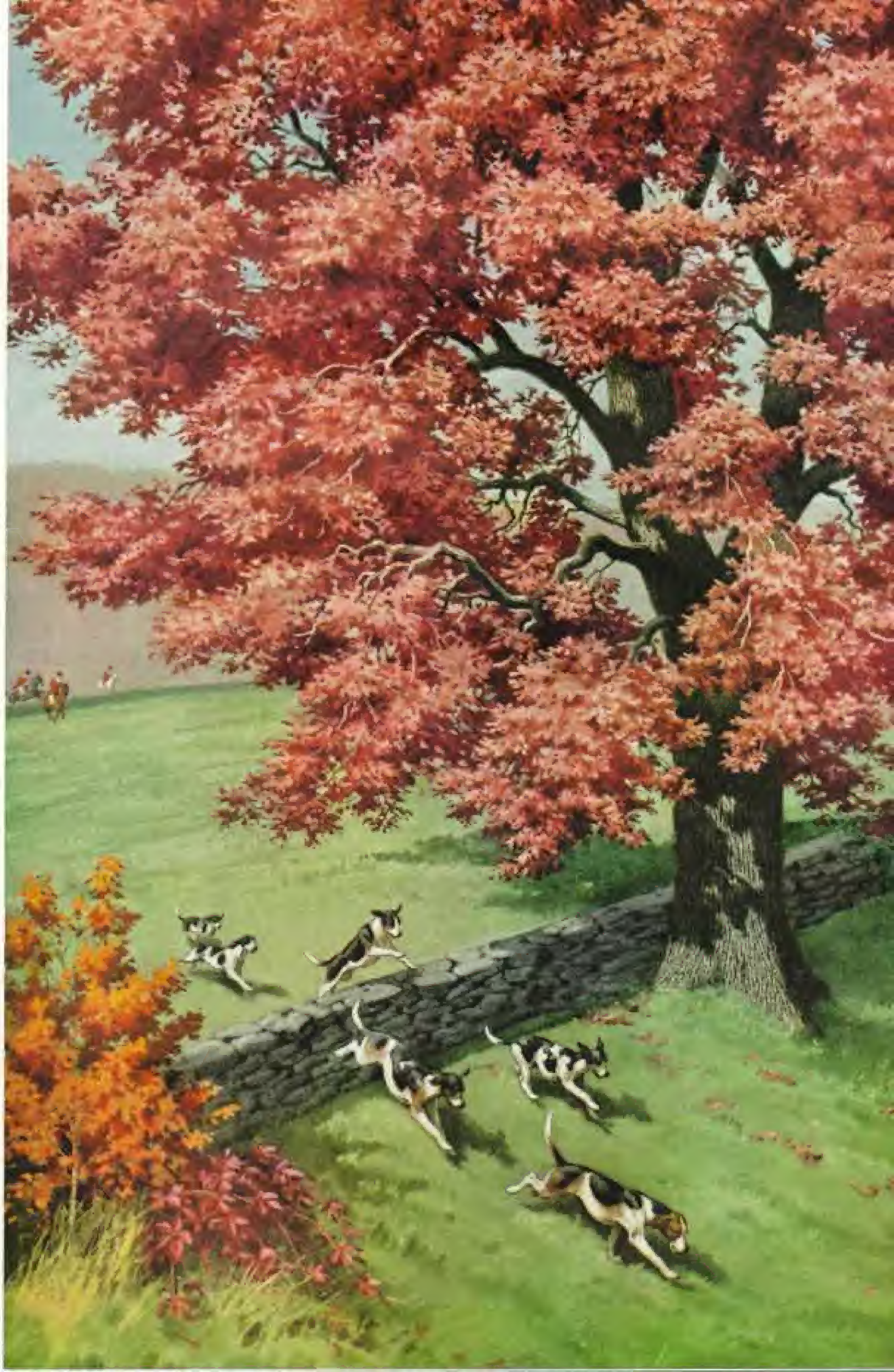
↓ Smooth young bark gives the white oak its name: it is ashy gray, almost white. With maturity it becomes darker, fissured, and plated. Spring leaves emerge bright red on top, paler and fuzzy beneath. In summer their upper surface turns a rich green, while the underside acquires a silvery, almost blue cast. Drooping male catkins, 3 inches long, are yellow; solitary female flowers (upper center) are red. Acorns are relatively sweet.

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White oak's acorns are big (three-fourths of an inch long), edible, and moderately sweet. They can be eaten in a variety of ways, including boiled, roasted, or baked in muffins. According to one 17th-century botanist, Indians also obtained from them "an oyle which they keepe to supple their joynts." Hogs like them; so do wild turkeys, deer, rabbits, squirrels, grouse, quail—and weevils. As a result, the chance of any particular acorn germinating into a mighty oak is extremely slim.

White oak's hard, heavy, strong wood ranks among the world's most useful. It is unsurpassed as flooring because of its appearance and hardness, its ability to take a high polish and resist abrasion. Because of its durability in contact with soil, it finds wide use for railroad ties. It makes fine furniture, boxes, crates, and watertight barrels, as well as strong, long-lasting wooden ships. Tannic acid from the bark helps to tan leather.

So highly regarded is the white oak that one enthusiast, William H. Jackson, of Athens, Georgia, remembered his favorite tree in his will by bequeathing it to itself. "The Oak That Owns Itself" still stands near Athens, identified by a marble marker; the deed is recorded in the town clerk's office.

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◀ Forester Shoots Branches off a Pine for Grafts on Other Trees

To develop super-trees, scientists graft cuttings from the tops of superior specimens onto rootstocks and plant them in seed orchards. When the grafted trees flower, they are dusted with pollen from other top-grade trees. Seeds thus carry the best characteristics of both parents.

This young loblolly was discovered near Georgetown, South Carolina. Only 20 years old, it soars 72 feet. Larry Howard uses a .22 rifle with telescopic sight to collect cuttings.

➔ Naval stores—tar, pitch, turpentine, and resin—are by-products of longleaf and slash pines. Technicians at the U. S. Forest Service Experiment Station near Lake City, Florida, test new methods of breeding and cutting.

Upper: The higher a tree's resin pressure, the greater its flow of naval stores. Crossbreeding two high-pressure pines increases production. Field men measure pressure by inserting hypodermic needles into resin ducts.

Lower: Woodman chips a face on a slash pine with a bark hack. Metal gutter nailed to the trunk channels sap into the bucket. Plastic bottle contains an acid solution that speeds the flow of sap.

—Tom Nottoli

J. Burch Roberts, National Geographic Photographer —





Tulip Tree Crowns the Forest with Flowers

(State Tree of Indiana, Kentucky, and Tennessee)

THE majestic tulip tree, or *Liriodendron tulipifera*, meaning "tulip-bearing lily tree," graces our woodlands under many a misnomer.

It is related to neither tulips nor lilies, but rather to magnolias, although its colorful, cup-shaped flowers somewhat resemble tulips. Moreover, though the tulip tree is widely known as tulip poplar or yellow poplar, it is not a poplar. That name is due chiefly to its soft, poplarlike wood, and perhaps also to the fact that its broad leaves dance in the slightest breeze as true poplar leaves do.

In beauty, however, the tulip tree matches its melodious Latin name, and it can in fact provide as much sweetness as any flower. Under ideal conditions—in rich, moist soil along a stream, for example—it is unexcelled as a honey plant.

An average 20-year-old tree may yield some eight pounds of nectar. Bees can turn this into four pounds of dark amber honey, more strongly flavored than most honeys.

Liriodendron is of ancient lineage. It was common in Europe before the Ice Age and flourished particularly in the Upper Cretaceous Period, the Age of Reptiles.

In the United States the tulip tree is rarely found west of the Mississippi. One exception is northeastern Arkansas; hence the old name "Poplar Ridge" (now Crowleys Ridge) for that part of the State.

Standing in the open, the tulip tree spreads its limbs quite close to the ground (left). But in forests of sweet gum, basswood, maple,

and oak, this fast-growing tree will push its branches up high into the sunlight. Its trunk rises straight and bare as a Greek column for 40 to 80 feet, and is topped by a cone-shaped crown of greenery; the flowers, with their petals colored light green on the outside, can hardly be seen from the ground.

Tulip-tree seeds have flattened wings and thus are easily carried off by the wind. Cleaned seed is so light that about 14,000 are required to make one pound.

The wood is straight-grained and easy to work and glue. It takes a high polish and holds stain, paint, or enamel extremely well. It shrinks and its nail-holding capacity is low, but it won't readily split or warp.

Heartwood Turns Rainbow Hues

The sapwood, frequently a creamy white and called whitewood, was once much in demand for carriage and wagon building. Oliver Wendell Holmes put it into his "Wonderful One-Hoss Shay": "The panels of whitewood, that cuts like cheese, but lasts like iron for things like these." The brown heartwood most often has a yellowish, greenish, or pinkish tinge, but sometimes turns blue, purple, lavender, or golden yellow.

Tulipwood today goes into veneers, plywood, wall paneling, and furniture, especially drawer bottoms; into musical instruments, boxes, radio and television cabinets, crates, and excelsior. It is ideal for turnery and also for hat blocks, partly because it does not absorb moisture during the steaming process.

← Settlers Fashioned Rafts and Cabins from the Majestic Tulip Tree

Among American hardwoods, the tulip tree ranks as the giant in height. It may reach 190 feet.

Indians hewed dugouts from the tall, straight trunk. Young Abe Lincoln must have split many a nail from tulipwood.

Cup-shaped, lilylike flowers appear in late May and early June. A single blossom may yield a spoonful of nectar. Dark-green, glossy leaves, unlike those of any other American tree, are 5 or 6 inches long on slender stalks of equal length. In autumn they turn bright yellow.

Mature bark is scaly and corrugated; its thinness makes the tree susceptible to fire damage.

◆ Fruits emerge as cone-like clusters about 2½ to 3 inches long, each made up of many seeds.

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The Live Oak, Mother of "Old Ironsides"

(State Tree of Georgia)

ARCHED into wide-spreading canopies that shade city streets and the pathways of old plantations, the live oak is among the most elegant and graceful of southern trees.

None is more richly festooned with Spanish moss. This silvery growth belongs to an air-plant family. It draws its nourishment not from the tree holding it up to the sun, but directly from the atmosphere. It does ob-

scure, however, much of the shiny foliage that gives the live oak its name.

Other oaks look dead part of the year, leafless or with their leaves brown and sere. Live oak (*Quercus virginiana*) keeps its green leaves until they are pushed off by new ones and thus is called an evergreen.

Live oak mantles the southeastern coastal plain, from southern Virginia to Florida and



✦ Live Oak Is Named for Its Leaves

Shiny, oblong leaves, 1½ to 5 inches long, always look fresh and alive.

Long male catkins pollinate the woolly, red-tipped female blooms.



Silvery Spanish Moss Drapes a Live Oak's Massive Limbs and Glossy Foliage

Right, above: Long-stalked acorn measures nearly an inch in length. A scaly cup covers one-third of the narrow nut. Furrowed, dark-brown bark, up to an inch thick, is often tinged with red.

southern Texas, growing even on sandy dunes. It seldom rises above 50 feet, but close to the ground it branches into three or four massive limbs that jut out almost horizontally for 50 feet or more, sometimes three times as far as the tree is high.

The wood is the heaviest of native oak, so tough that it frequently turns the edges of tools. Before the days of steel bottoms, it was

North America's most prized ship timber. The section where limbs fork from the trunk was singled out for stout braces, or "knees." The hull of the frigate *Constitution*, the gallant "Old Ironsides," was of live oak from St. Simons Island, now in Georgia's Glynn County. Under magnificent live oaks there, John Wesley found religious inspiration and Sidney Lanier wrote *The Marshes of Glynn*.

Longleaf Pine, Aromatic Sentinel of the South

(State Tree of Alabama)

IF EVER a tree deserved its name, it is the longleaf pine. Its leaves—specifically, the gracefully drooping needles—grow 8 to 18 inches in length; a variety of the species, near Rockingham, North Carolina, produces needles two feet long. Vivid green and shiny as if lacquered, these lovely needles are commercial prodigies, too, yielding pine oil to perfume soaps and cosmetics.

Longleaf pine (*Pinus palustris*) thrives chiefly along the eastern coastal plain, from southeastern Virginia to central Florida and west to eastern Texas, usually within 150 miles of the Atlantic or the Gulf of Mexico. It shares its sites: in comparatively dry areas, with bluejack, blackjack, and other oaks; on sands, with turkey oak, saw palmetto, and sand pine; and in moister areas, with slash pine, black gum, and laurel and water oaks.

Longleaf Bark Resists Fire

The orange-brown bark is scaly and thin, but in mature trees resists fire. That is why longleaf pine survives best in higher, drier areas where frequent fires destroy competing species. Deliberately set and properly regulated fire sometimes helps by removing bunch grasses that would prevent longleaf pine seed from reaching the ground.

Longleaf pine became Alabama's State tree under the name of "southern pine," a lumberman's term covering six pine species. But there can be little doubt that what the Alabama legislators had in mind was the long-

leaf, because of its local abundance and historical significance.

For many years this was the leading timber tree of the southeastern United States; in 19th-century England it fetched prices 25 percent above any other American pine. Formerly, too, longleaf pine was by far the most important American producer of naval stores—turpentine and rosin, used in the manufacture of soap, paper, varnish, and insecticides. Now slash pine shares this market.

Trunk Grows Straight and Tall

The tree's straight, slightly tapering trunk reaches a height of 100 to 120 feet and a breast-high diameter of about 3 feet. The oblong head, or crown, ranges from a third to half of the whole tree's height, and is made up of robust branches twisting upward.

The seedling, a mass of slender leaves virtually without stem, resembles grass. Another distinctive feature is the stout, white, candle-like terminal shoot of the sapling. The winter buds—large, oblong, and whitish—are fringed with a sort of cobwebby network.

The sapwood of the longleaf is almost white. There is no heartwood until the tree is about 20 years old; then it is light red to orange yellow. Hard, heavy, and durable, it goes into flooring, railroad cars and railroad ties, containers, millwork, prefabricated houses, masts and spars, kraft paper, and pulpwood. Farmers use longleaf needles for poultry litter and bedding for animals.



Longleaf Pine Sheds → Its Lower Branches

Straight, slightly tapering trunk may climb more than 100 feet. Robust branches twisting upward make up the crown. Lower limbs tend to prune off naturally. Scaly, orange-brown bark is fairly fire resistant.

← Longleaf pine wears beautiful foliage; gracefully drooping needles, 8 to 18 inches long, are vivid green and shiny.

Cone measures 5 to 10 inches long. Each scale is armed with a sharp, recurved spine. Seeds develop between the scales.

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Photograph by National Geographic Artist
Walter & Walter



Shortleaf Pine Heals Woodland Fire Wounds

(State Tree of Arkansas)

RARE is the southerner who has not enjoyed the resinous scent and yellow cheer of a fire kindled by "lightwood," or splinters of the shortleaf pine.

This pleasurable tradition goes back more than 400 documented years to 1541, when Hernando de Soto and his party wintered in the forests of shortleaf pine in what is now south-central Arkansas. "There was much snow," reported the contemporary historian, Garcilaso de la Vega. "Nevertheless, with the great luxury of firewood... they passed the best of all the winters."

Seedlings Sprout from Stumps

Good fuel that it is, shortleaf pine (*Pinus echinata*) still enjoys a curious advantage over the blazes that sometimes sweep its hillsides. Unique among American timber pines, it can sprout from the stump after burning or cutting, as many hardwoods do. Though these shoots seldom attain merchantable size, they produce an abundance of two-winged seeds that the winds carry like dust to reforest broad areas.

Shortleaf pine ranges through 23 States, from southern New York and Connecticut south to Florida, west into Texas and Oklahoma, and north into southern Missouri and Illinois.

Primarily, shortleaf pine is found on well-drained foothills and lower mountain slopes, but it also drills its taproot deep into coastal plains. It grows to 100 or even 120 feet, its

high branches forming a green pyramid on top of the long, slightly tapering trunk. Limbs are relatively slender and short. A 146-foot-high shortleaf pine in Morganton, North Carolina, noted by the American Forestry Association, has a breast-high circumference of 10 feet 7 inches.

The scientific name, *echinata*, bestowed by British botanist Philip Miller in 1768, comes from a Latin word meaning "hedgehog," suggested by the prickly green cone and needles.

Shortleaf is a leading commercial pine of the Southeast; lumbermen include it generally in the classifications of southern pine or southern yellow pine. Many areas rank shortleaf as the most profitable timber tree.

Shortleaf Masts a Navy

In the days of sailing ships, virgin shortleaf pine was prized for marine construction. In the early 1700's, shortleaf shared with white pine and other valued species the distinction of being proclaimed the property of the British Crown "for the masting of our Royal Navy."

Its wood, mostly yellow-brownish in color, is moderately hard, strong, and easily worked. Today it is an important wood for general construction, for millwork, boxes and crates, containers, flooring, prefabricated houses, and railroad ties. Furniture makers often use it as a core to carry the veneer of another wood. Its swift growth qualifies shortleaf pine for an increasing use as paper pulp.

Shortleaf Pines Lift Tall, Full Crowns Above the Rolling Hills of Arkansas →

↓ Large, scaly plates distinguish the shortleaf pine's cinnamon-red, inch-thick bark. Dark blue-green needles, 2½ to 5 inches long, remain on the tree 2 to 5 years. Purplish male flowers cluster near the ends of the branches (center). Small brown cones, 1½ to 2½ inches long, shed their seeds in autumn.





Eastern Cottonwood, Pioneer of the Prairies

(State Tree of Kansas)

THE towering trunk, massive crown, and quivering foliage that make eastern cottonwood a delight to the eye also shape a living history lesson.

Cottonwoods played a key role in America's westward expansion. To the pioneers who settled the sunbaked plains of the Midwest, the cottonwoods proved indispensable allies.

The trees shaded settlers from the burning sun; planted in groves, they protected dusty land from eroding winds; as timber, they built houses and stockades and gave firewood through sub-zero winters; their leaves helped feed livestock, and the inner bark furnished winter forage for horses.

Cottonwood Often Saved Homestead

Designating the cottonwood the State's official tree in 1937, the Kansas legislature gratefully noted that "the successful growth of the cottonwood grove on the homestead was often the determining factor in the decision of the homesteader 'to stick it out until he could prove up on his claim.'"

Actually, the 10 species of cottonwood native to the United States are members of the poplar family. The colloquial name sprang from the cottony fluff that appears on the seeds.

Eastern cottonwood (*Populus deltoides*), a giant of its genus, sometimes attains a height of well over 100 feet with a breast-high diameter of 5 to 8 feet. It ranges from southern Canada to the Gulf of Mexico, and from the

Atlantic seaboard as far as a line running roughly from the Dakotas to eastern Texas. Thriving in rich, moist lowlands near streams and lakes, it is particularly abundant west of the Appalachians.

Cottonwood is the first tree to invade many prairie areas. Fast growth, enormous reproductive capacity, stump sprouting, and roots that quest far for moisture make the tree an ideal pioneer. Its one drawback is the shallowness of its root system, weakening the cottonwood's holding power in high winds.

As leaves blanket the ground year after year, the organic content of the soil is enriched to a point where it will support other trees, such as river birch, ash, sycamore, silver maple, and pecan. Ironically, once the cottonwood's work is done, such trees soon replace it. The cottonwood is short-lived and does not reproduce well in the shade of forests.

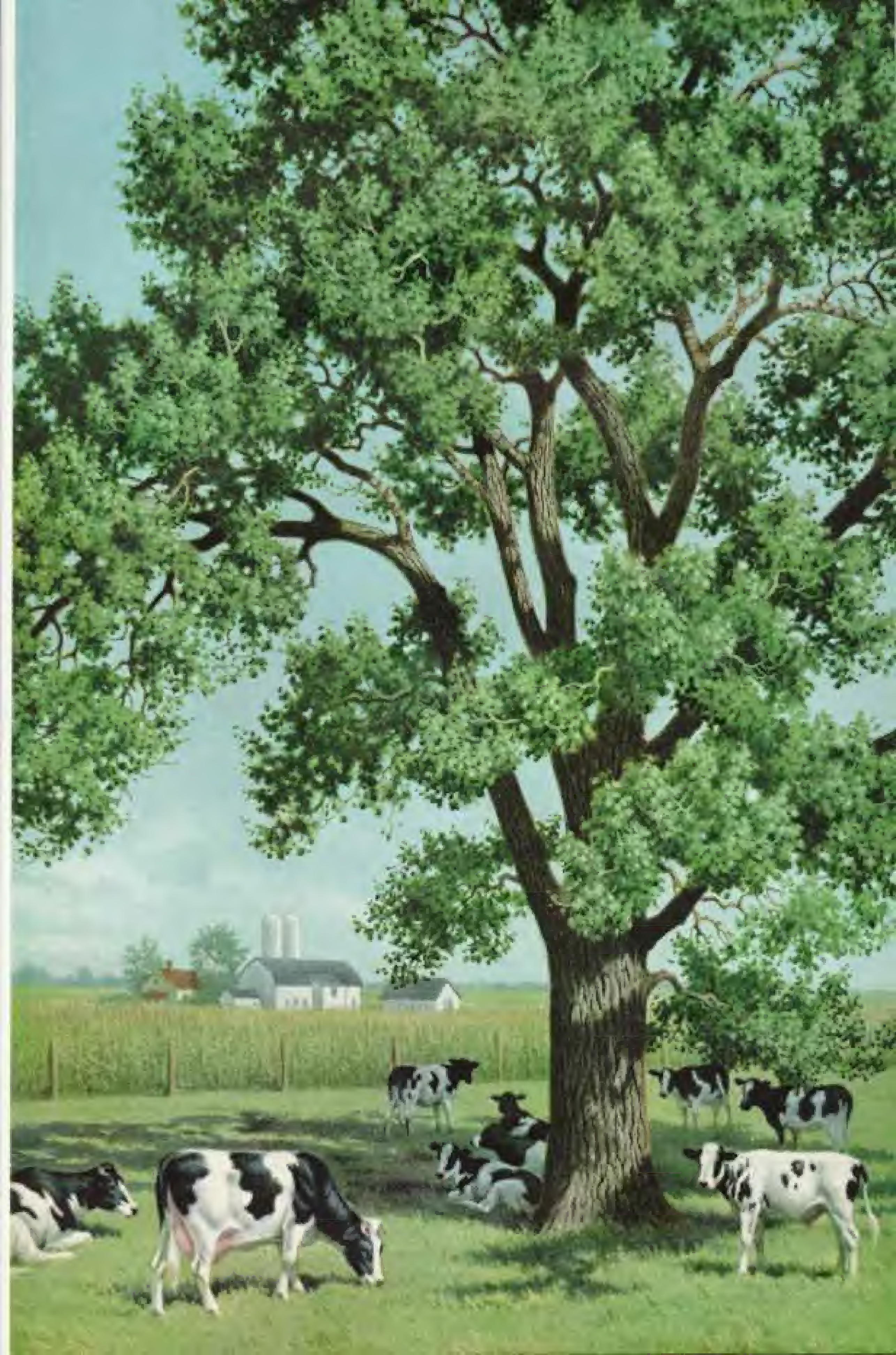
While the soft, light lumber of the eastern cottonwood served our forefathers well, its present-day uses are limited by poor durability, low nail-holding capacity, and a tendency to warp. It is chiefly used as backing for furniture veneers and, because it takes stenciling well, in packing crates and boxes. It also furnishes pulpwood, excelsior, and firewood.

Leaf beetles and caterpillars occasionally strip the leaves from eastern cottonwoods. Aphids, leaf wilts, and *Cytospora* bark-kill are other sources of trouble. Soils with high calcium content, or to some extent, iron deficiency, tend to bleach the leaves.

Cottonwood's Widespread Boughs Shade a Herd of Cows on the Kansas Prairie →

↓ Bark of young cottonwoods is smooth and greenish yellow. On mature trees, like the one shown, it becomes grayish and deeply furrowed. Triangle-shaped leaves, 3 to 7 inches long, are regularly toothed, glossy green above, and paler beneath. Flowers show in springtime with the unfolding leaves. Male catkins are stout and densely flowered. Female blooms are more widely spaced and grow larger as the fruit ripens. In May they discharge tiny seeds wrapped in cottony fuzz; hence the name, cottonwood.









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Tree-size Jackstraws: Two Million Logs Jam a Storage Pond as Big as a Football Stadium

Until the early 1930's southern pine trees such as slash, shortleaf, longleaf, and loblolly were considered too resinous for pulping. When chemists finally solved the problem, a new industry sprang up in Dixie. Today 67 southern mills turn out some 13 million tons of pulp a year.

This bowl is part of the new \$80,000,000 newsprint mill of Bowaters Southern Paper Corporation at Calhoun, Tennessee, which consumes nearly 1,500 cords a day and produces 300,000 tons of newsprint annually.

The tank is the first of its kind ever built for a paper mill. Storage in water minimizes insect damage and fire risk and preserves logs against decay. Lined with concrete, the tank measures 489 feet across, 45 feet in depth, and holds enough water to float a 10,000-ton ship.

Logs arrive at the mill by train, barge, and truck. Parallel cable conveyers carry them to the center of the pond, where twin rotating stackers fling them into the water.

Two 200-foot-long gantry cranes ride the tracks around the rim.

Above: Each crane hoists some five tons of logs every 90 seconds and deposits them on turntables on the central island. Conveyers take them to the wood preparation house.

Bowaters Southern Paper Corporation



Eastern Redbud Heralds Spring with a Blush

(State Tree of Oklahoma)

THE flaming springtime blossoms of the eastern redbud (*Cercis canadensis*) make it one of the most strikingly beautiful members of the vast legume, or pea, family. The redbud can also boast of being among the first trees botanically "discovered" in the New World.

In 1570 King Philip II of Spain sent his physician, Dr. Francisco Hernández, to Mexico to investigate the region's natural history, antiquities, and political conditions. Hernández's report gave the first published account of this colorful flowering tree.

Blossoms Turned Red with Shame

The tree has also gained a more dubious measure of fame. According to time-honored legend, Judas Iscariot—after betraying Jesus—hanged himself on a Near East cousin of the redbud called *Cercis siliquastrum*. The white flowers blushed red with shame and have remained so ever since. In popular usage, this Old World species has long borne the name "Judas tree."

The ancient tradition crossed the Atlantic with early settlers, who transferred the legend as well as the name to the inoffensive redbud. However, the tree has never lacked for defenders of its reputation. Among the most eloquent is the Georgia poet Alfred T. Hind, who wrote:

No more call it Judas Tree,
Redbud, rather, let it be.
Tarnish not its springtime glow
With a crime of long ago.
Undeserved its hateful fame;
Let its beauty give it name.*

George Washington and Thomas Jefferson were admirers of the redbud, and Washington planted the trees in profusion on the grounds at Mount Vernon.

Eastern redbud ranges from lower Connect-

icut and New York to north-central Florida, west to eastern Texas, and north to Michigan. Across the United States border it penetrates southwestern Ontario; in the south it extends from Coahuila to San Luis Potosi in Mexico.

Although ordinarily a small tree up to 30 feet high, eastern redbud occasionally attains a height of 50 feet. The American Forestry Association's champion, near North Kingsville in Ohio's Ashtabula County, has a 40-foot spread and, 2 feet above the ground, measures 8 feet in circumference.

Eastern redbud is a frequent associate of flowering dogwood as an understory in hardwood forests and is characteristic of stream banks and bottomlands; the two trees often bloom together and become the showiest spring ornaments of many of our eastern woodlands.

In Oklahoma, where it is the State tree, and in other western reaches of its zone, the blossoming redbud announces the annual arrival of spring by transforming thousands of ravines and creek bottoms into winding ribbons of vivid pink.

Flower-bud Salad and Fried Fritters

The redbud is neither large enough nor sufficiently abundant for its wood to be of any economic importance. However, it is used in some localities for turnery and small cabinetwork.

Though it is hard and durable, at best redbud wood is only moderately strong. Heartwood is yellowish or brown, often with darker streaks; its somewhat golden luster deepens to russet with age. The sapwood is distinctly paler and often white.

The tree's chief value is as an ornamental, and it has been cultivated as such since the 1600's. The redbud produces large numbers of very light seeds, but germination is poor without pretreatment to soften the hard seed coats. The seeds are a favorite food of bobwhites and some other birds.

In rural districts the flower buds and blossoms are sometimes eaten in salads or pickled; buds, flowers, and young pods go into fried fritters.

Fried redbud flowers are also a Mexican delicacy. In addition, Mexicans use the redbud's astringent bark for medicinal purposes.

* From *Poems of Trees*, A Sidney Lanier Memorial, Vol. VI. Compiled and edited by Wightman F. Melton. Curtis Printing Co., Inc., Atlanta, Ga., 1937.

← Eastern Redbud's Vivid Blossoms Dress an Oklahoma Stream Bank

Pealike, rosy-pink flowers grow in clusters of 4 to 8. Preceding the leaves, they frequently emerge directly from trunk and branches.

Glossy, heart-shaped leaves are 3½ to 5 inches wide, slightly hairy, and with veins like the fingers of the hand. They turn yellow in fall.

Brown or reddish bark is scaly and often fissured or ridged. Thin, flattened pods, 2½ to 3¼ inches long, bear shiny dark-brown seeds.



Magnolia, a Romantic Antique

(State Tree of Mississippi)

NEAR the south portico of the White House grows a magnificent southern magnolia planted by President Andrew Jackson to honor his beloved wife—"something green in memory of Rachel."

A glory of the South in song and story, this large-flowered tree holds a unique place in regional affection. Mississippi, for example, is not only the "Magnolia State," but also made the southern magnolia its State flower, as did Louisiana.

Known in some localities as bay laurel and bull bay, the southern magnolia (*Magnolia grandiflora*)

Magnolia Suggests the Old South

The creamy-white flower, largest of any tree native to the United States, unfolds through late spring and into summer. An average specimen spans 8 inches. Each lemon-scented bloom carries 6 to 12 petals. Leathery, short-pointed leaves are a polished deep green above, a rusty velvet beneath.

✦ Light-colored bark is broken into small, thin scales. Cone-like fruit is 3 to 4½ inches long. When young, it is coated with a glossy white wool but later turns rusty brown.

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Illustrations by National Geographic Artist Walter A. Weber

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is but one of eight magnolias native to the eastern United States and Mexico, among 35 species in the world.

Traditions surrounding the magnolia are ancient. The genus was named in honor of Pierre Magnol, physician to King Louis XIV of France and one of the first men to classify plants by botanical families.

Long before the 17th century, magnolias were cultivated by the Chinese, who preserved the buds for medicinal use and for seasoning rice. Geologically, magnolias may be traced back long before man. Many scholars believe them to be a primitive type of flowering plant perhaps dating from 100 million

years ago, when dinosaurs walked the earth.

The southern magnolia grows as a native tree in the coastal plain, from southeastern North Carolina to central Florida and west to eastern Texas. Cultivation, however, has considerably extended its range.

A tower of glossy leaves with a bell-shaped or nearly cylindrical crown, magnolia grows to a normal maximum of 60 to 80 feet. The trunk may reach 2 to 3 feet in diameter.

Magnolia wood, off-white in color, turns brown on exposure. Most magnolia lumber goes into furniture, though manufacturers of venetian-blind slats favor the wood for its resistance to twisting and cupping.

Pecan Bears Sweet-kerneled Treasure

(State Tree of Texas)

SPAIN'S Capt. Alvar Nuñez Cabeza de Vaca, shipwrecked and wandering across Texas, was captured in 1533 and enslaved by the Mariames Indians. The noble Spaniard was put to work pounding pecans in gourds with stumps of wood.

As the captain later reported, "these fine nuts," ground with grain, were the Mariames' sole food for two months of the year. Thus Cabeza de Vaca's chronicle became the world's first published notice of the pecan.

The tree, long believed by Indians to be a manifestation of the Great Spirit himself, was highly valued by North American settlers. They adopted the Algonquian name

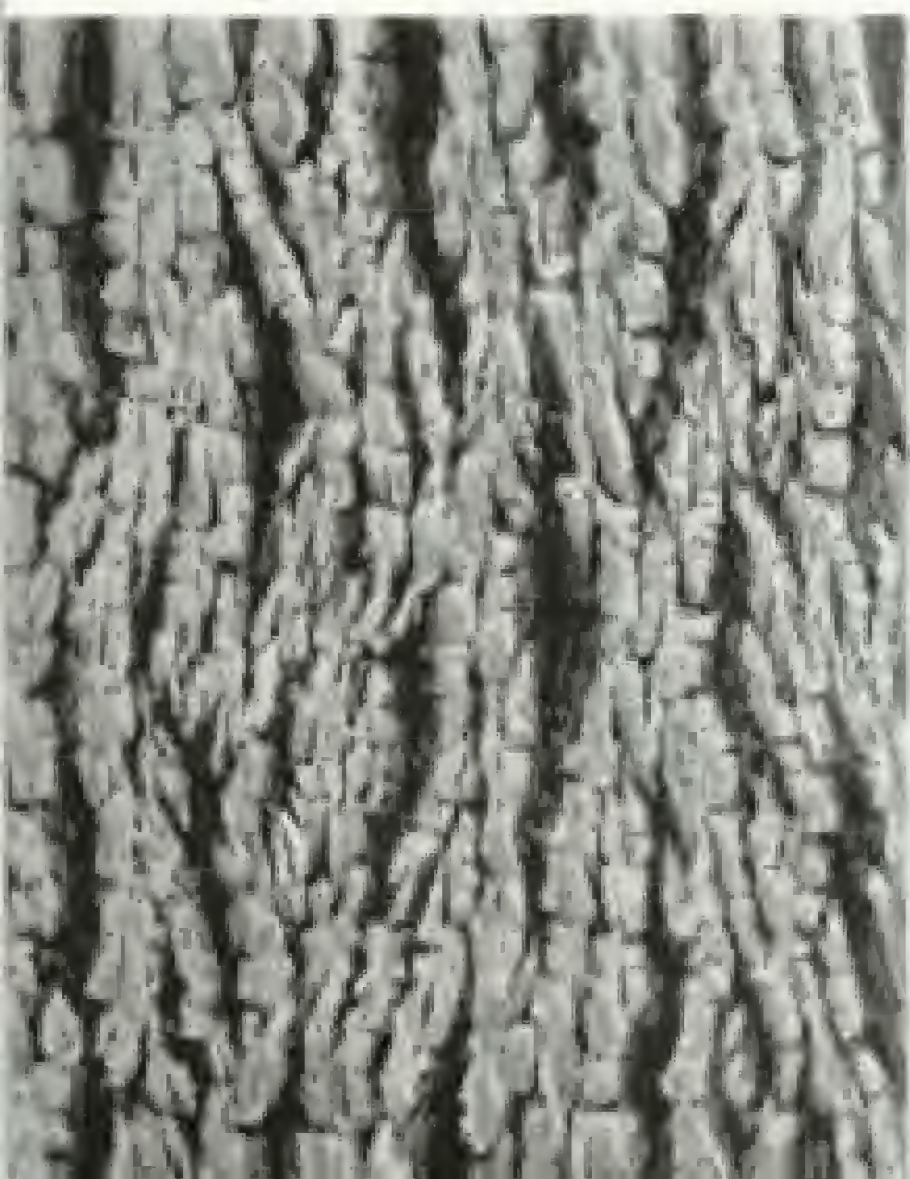
pacan and sought out the tree's cooling shade, nourishing kernels, and strong wood. Moving westward, pioneers found groves of seedlings rooted in deep rich soil near streams; turkeys and opossums feasted on the nuts.

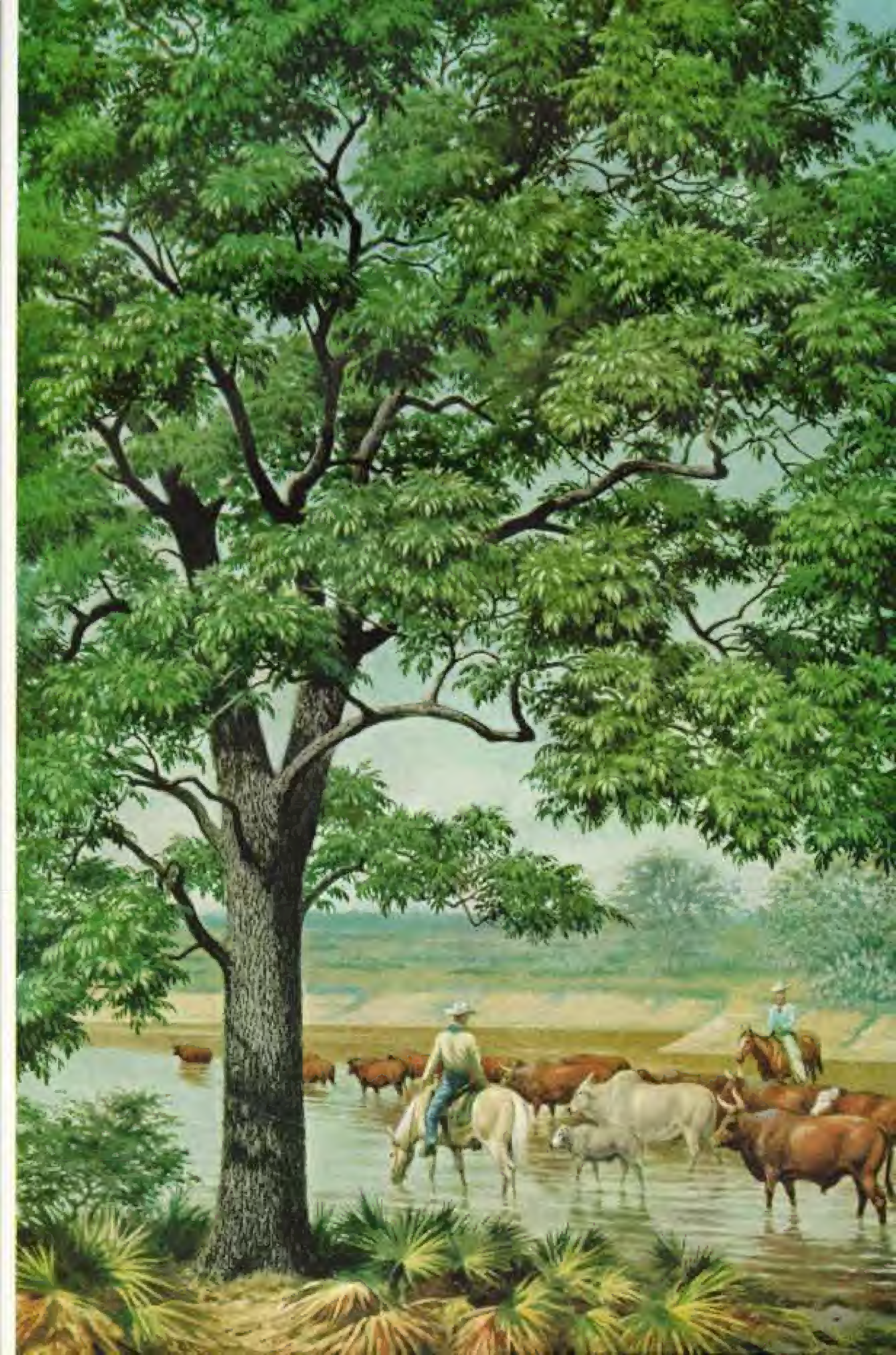
Wild pecans grew from northwestern Illinois southward along the valleys of the Mississippi, Ohio, Tennessee, and Cumberland Rivers. In Texas the species crossed the Rio Grande deep into Mexico. Cultivation has greatly extended this natural range.

Equipped with a rather shallow root system and a short taproot, the pecan is sensitive to severe frost and too frequent inundation. It is somewhat subject to bark beetles and the

Pecan Spreads a Cool, Leafy Arbor over Texas Cowhands and Cattle

↓ Mature bark is deeply furrowed and grayish to light brown or reddish. Drooping male catkins hang like graceful tassels. Female blooms (upper center) have four-lobed, cuplike receptacles; these flowers appear slightly larger than life size. In autumn the husk of the oblong fruit splits to the base and opens into four wings, exposing a smooth, brown, thin-shelled nut, 1 to 2 inches long. Pecan leaves, like those of other members of the walnut family, are made up of 9 to 17 leaflets sharing a common stem.







Rows of Trees Shield Prairie Farmsteads from Eroding Winds and Blinding Blizzards

Blowing dust threatened this Oklahoma farmland until the Federal Government launched a major tree-planting program in 1934. Since then more than 300 million trees have been planted along 45,000 miles of the Great Plains. Shelter belts protect soil from wind damage for a distance 20 times the height of the trees. Cottonwood, Chinese elm, juniper, hackberry, Osage orange, and many other trees do this work well.

southern pecan leaf blotch. But given warm, long summers in proper earth, the tree grows handsomely.

Pecan (*Carya illinoensis*, also called *C. pecan* and *Hicoria pecan*) is the largest member of the hickory genus. When mature, it normally reaches 100 feet in height; but foresters have recorded pecans 150 and even 170 feet high, with diameters of 5 to 7 feet.

Commercial orchards often use mechanical tree shakers to dislodge the smooth, brown, thin-shelled nuts. But generations of boys with bamboo canes have reached up into the

trees to flail the branches and bring down sweet-kernelled prizes. Shelled, the kernels average 100 to the pound.

Union Soldiers Took Pecans North

The pecan was first introduced into cultivation about 1766. Early attempts to graft or bud trees were unsuccessful until a slave of the Louisiana planter Telesphore J. Roman succeeded in grafting 16 trees in 1846. After the Civil War, Union troops returned home from the South with pocketfuls of pecans, and some they planted.

Commercial pecan raising, however, waited until comparatively recent years. Heavy plantings for orchards came between 1920 and 1930. Improved varieties have been developed so that they now number more than 100.

The world's largest single grove of cultivated pecans was started in 1933 near Las Cruces, New Mexico; today 75,000 pecan trees grow there on 4,000 acres of the Stahmann Farms, Inc., irrigated by wells and by water of the Rio Grande.

Pecan wood is in increasing demand for furniture and flooring. Hard and heavy, it takes polish handsomely and is highly resistant to sharp, sudden impacts. Sapwood is whitish or lightly tinged with brown; heartwood, pale to reddish brown. Like that of other hickories, pecan wood is prized as fuel for smoking meats.



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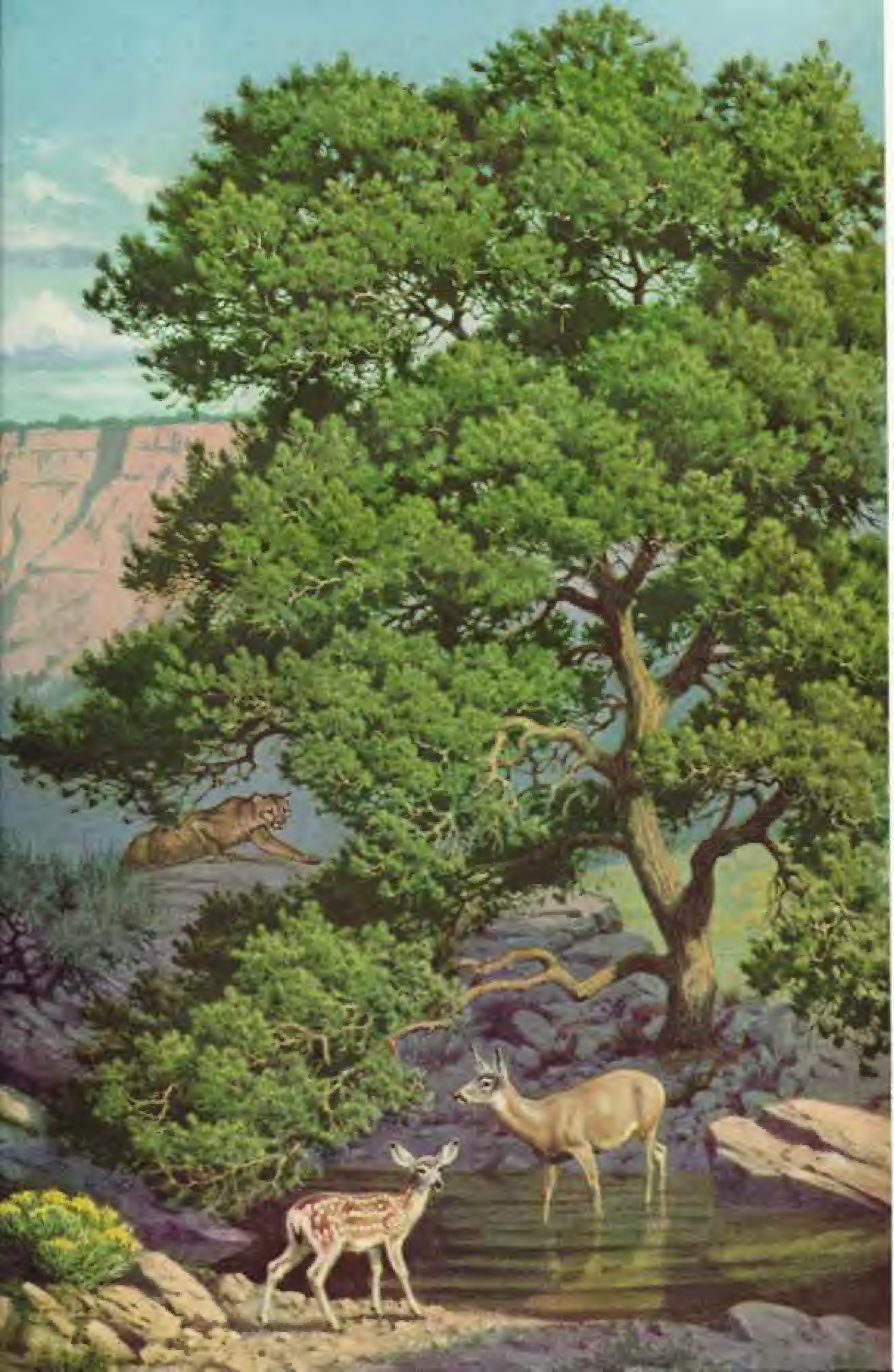
Yehman Westcott, National Geographic Photographer

Young Mouths Water for Pecan Pralines Hot from the Pan

School children line up at the counter of a New Orleans cafe for Ma Lou's sweets, a blend of brown sugar, nuts, and butter.

✦ Many orchards use mechanical shakers to thresh pecans. A revolving steel pole aboard a tractor (left) knocks down the fruit in this Moody, Texas, grove. Some of the trees are more than 50 years old.





The Piñon Befriended Indian and Explorer

(State Tree of New Mexico)

THE botanical discoverer of the piñon,* Frederick Adolphus Wislizenus, collected the first specimen of the tree in 1846 in the Rio Grande Valley of what is today New Mexico.

However, the Spanish conquistador Cabeza de Vaca (page 538) was the first white man to see a piñon—and it saved his life.

Shipwrecked in the Gulf of Mexico in 1528, he and three companions, ill-clad, barefoot, and weaponless, traced a tortuous eight-year odyssey across the vast and hostile Southwest toward Spanish outposts in Sonora.

Trees Saved Conquistadors

While crossing the wide plains of Texas, the four men almost died of hunger. But in the autumn, gaunt, emaciated, more dead than alive, they stumbled into piñon country just as the pine nuts were ripe. In his account of their wanderings published in 1542, Cabeza de Vaca states simply that the nuts saved their lives.

The common piñon (*Pinus edulis*) is by far the most important of our four species of piñons, or nut pines. The tree occurs in the Rocky Mountains from southwestern Wyoming through Colorado, Utah, Arizona, and New Mexico to western Texas. It dodges Nevada but crops out again in southeastern California and in the Sierra San Pedro Mártir of Baja California.

The typical piñon is a short, often gnarled, twisted and crooked tree. The trunk is from 6 to 8 feet high and is sometimes divided. When young, the tree possesses a broadly conical top, but the tip flattens with age.

In the most favorable sites this conifer occasionally grows 40 to 50 feet high.

The piñon's rate of growth is notoriously slow, and its life expectancy may run as high as 375 years. Drought-resistant, it can survive in areas with less than 12 inches of annual precipitation. At the same time, it is highly frost-resistant. In fact, the piñon can withstand fluctuations of temperature from minus 25° to plus 110° F.

The tree's hardiness combined with its shallow root system makes it one of man's staunchest allies in the battle against erosion. In the Southwest the piñon may often be the sole tree clinging to otherwise desolated slopes, protecting the soil to the last against the ravages of the elements.

Economically the seeds, or nuts, constitute the tree's most valuable feature. The harvest averages more than a million pounds a year, and soared to a record eight million pounds in 1956. Crops tend to be spotty, with heavy yields, that range up to 300 pounds per acre, appearing only at two- to five-year intervals.

"Indian Nuts" Flavor Candy

Indians and Mexican-Americans gather most of the commercial crop, which is then bartered or sold. The bulk of the seeds go to New York, where they are shelled by machine and used in the manufacture of candy.

Natives of the region, however, are among their own best customers. Most southwesterners are adept at shelling and eating the seeds, lightly roasted in Indian fashion.

* Many authorities today use the Anglicized spelling *piñon* instead of the Spanish *piñon*.

← Piñon's Gnarled Arms Cloak a Puma Stalking Deer at a New Mexico Spring

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→ Paired dark-green needles, 1½ to 1¾ inches long, remain on the hardy, drought-resistant tree 3 to 9 years. Stout twigs are orange when young, but turn grayish or reddish brown with age. Light-brown cones, 1½ to 2 inches long, have thick, prickleless scales.

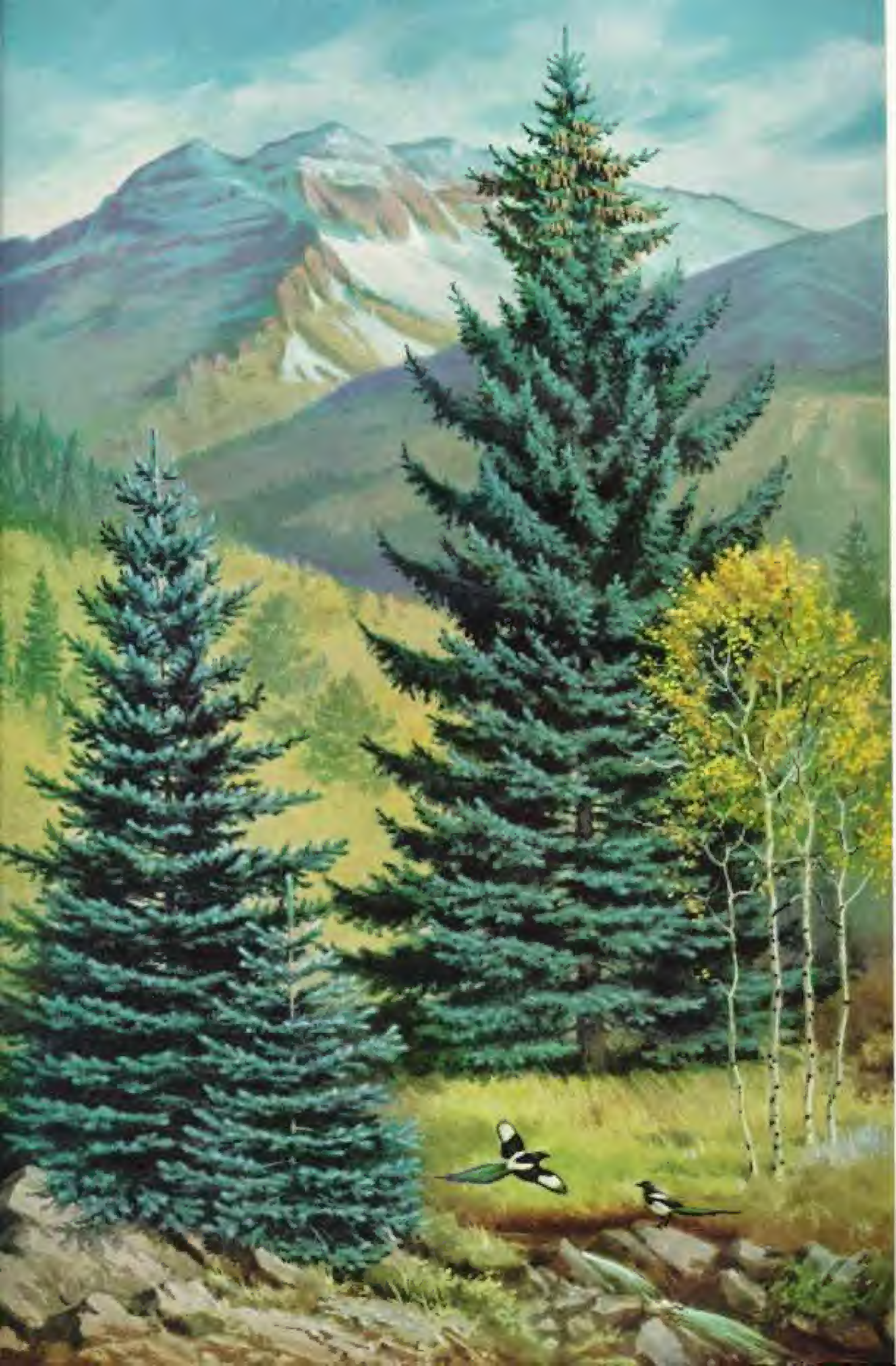
Wingless edible seeds, often called Indian nuts, are about ½ inch long.

Scaly, reddish-brown bark is furrowed and ridged.

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Illustrated by National Geographic Artist
Walter A. Weiss





Although piñon wood is soft, weak, and brittle, it is resinous and makes excellent fuel; it is particularly valued as a source of charcoal.

Archeologists have turned up graphic proof that the piñon has been furnishing mankind with warmth, food, and shelter for centuries. In the ruins of ancient Indian dwellings they often find the ashes of piñon wood fires, dry nuts that had been pounded into flour, and

roof beams and door lintels hewn from piñon logs.

Charred and weathered piñon fragments were among the ancient logs used by National Geographic Society expeditions of the 1920's, under Neil M. Judd and A. E. Douglass, to develop a tree-ring calendar. This made possible the dating of 1,000-year-old Pueblo Bonito, New Mexico, and other early ruins.

Blue Spruce, Pride of the Rockies

(State Tree of Colorado and Utah)

OF OUR seven native spruces, the blue spruce (*Picea pungens*) is the most popular in ornamental cultivation. The faultless symmetry and silvery-blue color of the younger trees make them landscaping favorites the world over.

But the blue spruce, so impeccable and docile on lowland lawns, is by nature a rugged mountaineer. In fact, it was botanically discovered in 1862 on Pikes Peak by the renowned plant explorer, Dr. Charles C. Parry. In honor of its discoverer, the tree was originally known as var. *parryana* of the Sitka spruce. Colorado spruce and silver spruce are widely used synonyms.

Mountain Sentries Stand Tall and Proud

Throughout the blue spruce's native domain—the Rocky and Wasatch Mountains in Idaho, Utah, Colorado, Arizona, and New Mexico—tall, weathered specimens cleave the sky like jagged spears. Lofty and straight, boughs sighing in the wind, the tree is as proud as the peaks it graces.

It is found at elevations of 6,500 to 11,000

feet, sometimes in pure stands but often mixed with other conifers as well as with cottonwoods, willows, and birches. A favorite site is near mountain streams.

The full-grown blue spruce averages 80 to 100 feet in height. However, 150-foot giants have been recorded. The American Forestry Association's champion, in Colorado's Gunnison National Forest, stands 123 feet tall with a breast-high girth of almost 12 feet.

The lower branches of the blue spruce spread out like wide, horizontal shelves, gradually decreasing in length toward the crown. From the symmetry of the branches comes the tree's handsome pyramidal outline.

The wood is weak, soft, and light, with a somewhat satiny luster. Blue spruce has no commercial importance as timber.

The tree has attained its greatest fame through cultivated varieties, of which the best known is probably the Koster blue spruce. Growth is slow, particularly in the initial phases. Five-year-old trees attain a height of only 12 to 20 inches; 10-year-olds measure between 2½ and 8½ feet.

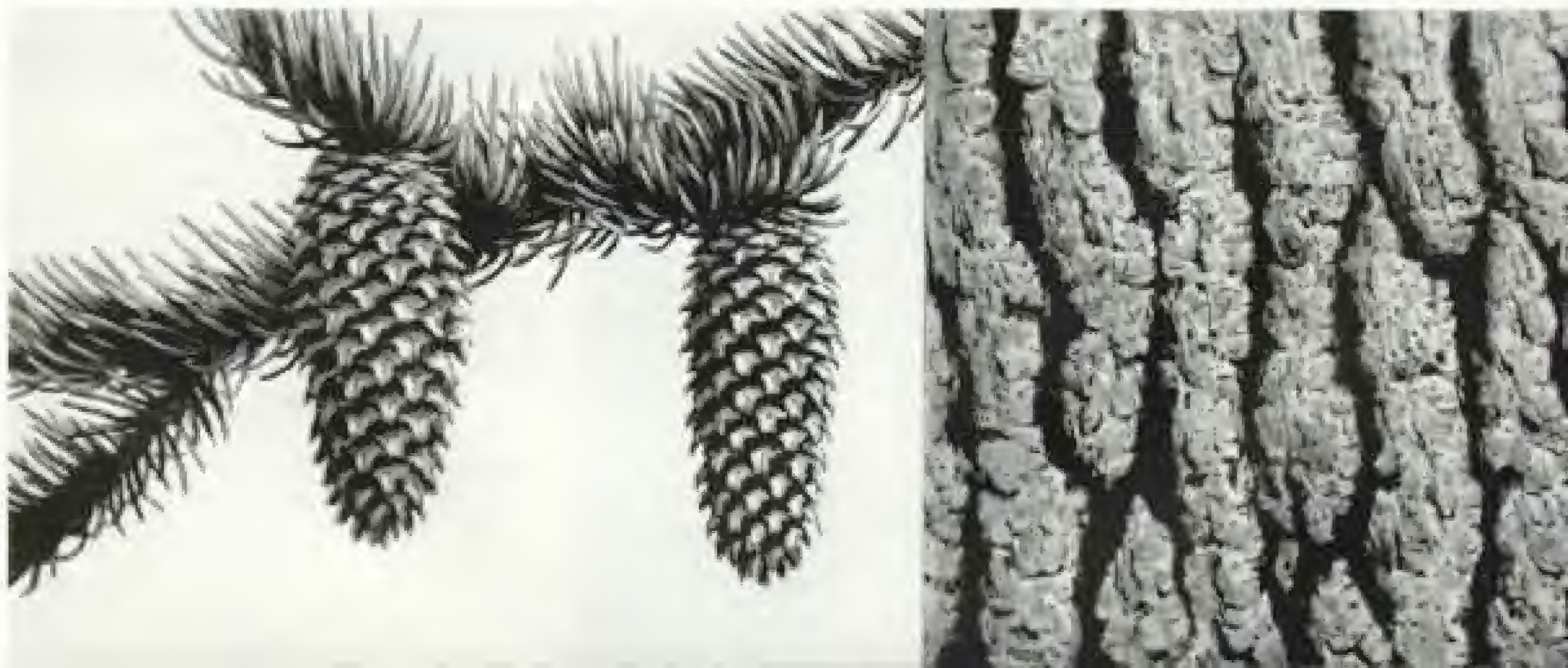
♣ Blue Spruces Raise Evergreen Pyramids in the Rockies; Magpies Fly Among Them

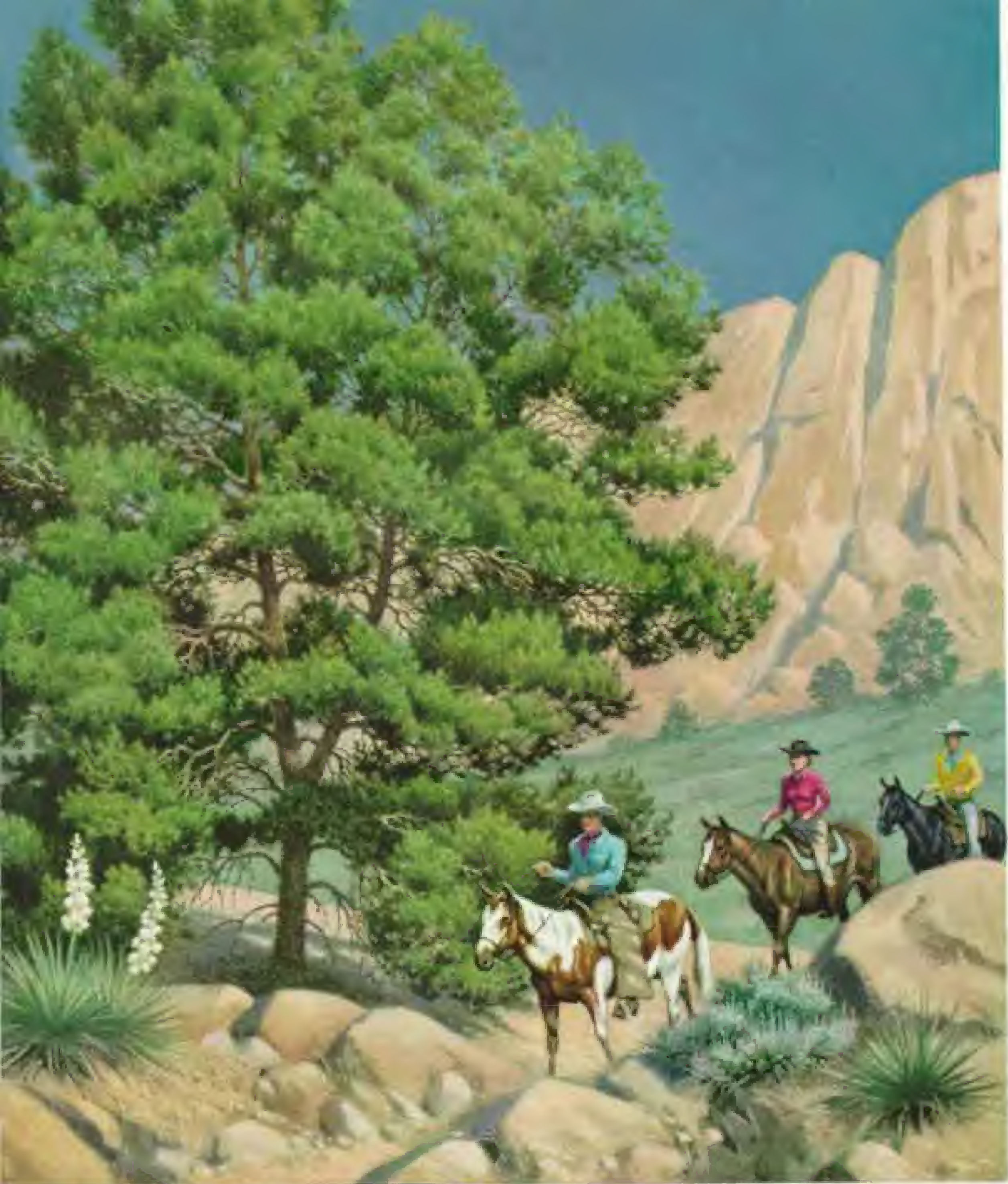
♣ Needles end in sharp, bristly tips. On young trees they are a bright silver blue, but turn dull green or blue green within 3 or 4 years. Pale-brown, usually stalkless cones average 3 inches in length. Bark is furrowed.

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Illustrations by National Geographic Artist Walter A. Weber





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Hardy Singleleaf Piñon Dwells in Arid Lands

Singleleaf piñon is unique among pines because needles are never clustered and rarely paired. Pale gray-green needles, 1 to $2\frac{1}{4}$ inches long, may linger 10 years on the branches. Nut-bearing cone is 2 to $2\frac{1}{2}$ inches long.

Young bark is grayish, but darkens and roughens with age.

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Paintings by National Geographic Artist
Walter A. Wilder



Singleleaf Piñon Yields an Indian Harvest

(State Tree of Nevada)

THE singleleaf piñon claims distinction from its discovery by a presidential candidate, the stormy "Pathfinder," Gen. John Charles Frémont. This colorful soldier and Far West explorer was convicted of mutiny by Army court-martial, but went on to lose the 1856 presidential race to James C. Buchanan by only 60 electoral votes.

In his *Narratives*, Frémont relates that on April 13, 1844, as he crossed the southern slopes of the Sierra Nevada, "a new species of pine made its appearance." On April 19 he writes: "There was nothing but rock and sand . . . even the fertility of the mountain seemed withered by the air of the desert. Among the few trees was the nut pine."

Small and ground-hugging, the singleleaf piñon (*Pinus monophylla*) ranges from southern Idaho through western Utah and northwestern Arizona across most of Nevada into southern California.

Very slow-growing, with short trunk and short, twisted branches, the tree seldom exceeds 15 to 20 feet in height. However, the finest known stand, on Magruder Mountain, Nevada, boasts specimens 50 feet tall.

Singleleaf piñon chiefly inhabits the dry lower slopes of mountains and foothills, as well as mesas and canyons, below the por-

derosa pine belt and above the habitat of the common piñon (*Pinus edulis*).

The tree is extremely hardy. In the Mojave Desert region it sustains temperatures ranging from below zero to 122°, and is able to withstand extended periods of drought.

The nuts of the piñon, thin-shelled seeds $\frac{1}{2}$ to $\frac{3}{4}$ of an inch long, have always been a prime food of western Indians, who referred to piñon stands as their "orchards." In good years a single Indian can still gather as many as 40 bushels of nuts. Much of the bloodshed in early settlement days stemmed from the white man's destruction of the singleleaf piñon.

The Indians of Nevada still harvest nuts with dancing and feasting. Just before the scales open, they beat off the unripe cones with poles and lightly scorch them by burning brush over them. The resin is thus burned off, the scales open, and the nuts are slightly roasted. The Indians then lay the cones in the sun and thresh out the nuts.

The wood of the singleleaf piñon is fairly light. Yellowish brown in color, it is soft, weak, and brittle. It serves the Indians as firewood and also makes superior charcoal. In fact, mining experts in the Basin Region prefer it to all other charcoals for smelting.

Blue Paloverde, Golden Glory of the Desert

(State Tree of Arizona)

THERE died in Phoenix, Arizona, in 1891, a white-bearded prospector known as "The Dutchman." He left behind a shoebox of gold ore and a tantalizing legend.

The Dutchman with his dying breath supposedly had told a friend how to find a secret gold mine in Arizona's Superstition Mountains. The key landmark was a paloverde tree with a distinctively pointing branch. Neither the Lost Dutchman Mine nor the landmark has ever been found, for paloverdes lift their twisting branches all through the desert country, and most of these angular trees seem to point at something.

Though its name means "green tree," it is perhaps natural that Arizona's official State tree should be associated with gold. The Spaniards who first explored the American Southwest and named the paloverde were seeking the legendary gold-paved Seven Cities of Cibola. Their modern descendants still

sometimes refer to the blossoming paloverde as *lluvia de oro*, or "rain of gold."

Probably the handsomest of the three species native to the United States is the blue paloverde (*Cercidium floridum*). Its common name describes the blue-green bark, which fulfills a special function in the desert. During the dry season the small compound leaves of the blue paloverde wither and drop off, thus conserving moisture. Green elements in the bark do the work of foliage.

A small, short-trunked tree, it grows from 15 to 30 feet in height. The trunk rarely measures as much as 20 inches in diameter and often slopes in grotesque posture.

Blue paloverde grows from Arizona westward to southeastern California and south into Mexico. From nearly sea level to an elevation of 3,500 feet it clings to the irregular banks of arroyos and dry washes, on the spring flood plains and, less commonly, in

the brown lower foothills of the desert country. Though its pale yellow-brown wood is sometimes used for lathe-turned objects, blue paloverde has little commercial value. The wood is soft, brittle, and heavy. It burns quickly, but with an unpleasant odor.

When in bloom, the tree produces a good honey. The pealike pods, although not highly palatable to domestic livestock, offer an important food source in time of drought. Ground into meal with those of mesquite, the seeds were once a staple in the diets of southwestern Indians. Today, perhaps the tree's chief economic value lies in slowing erosion.

Pima Indians tell their children a nursery tale about this perpetually green tree. A small boy, unhappy over a whipping from his grandmother, ran away from home. "I will turn into a paloverde," he said. "The mountains are bare and covered with rocks. I will make them green and stand there forever."

Blue Paloverde Opens a Golden Umbrella in Arizona

Pecurries, or javelinas, the native wild hog, browse beneath this specimen, neighbor to a lofty saguaro cactus.

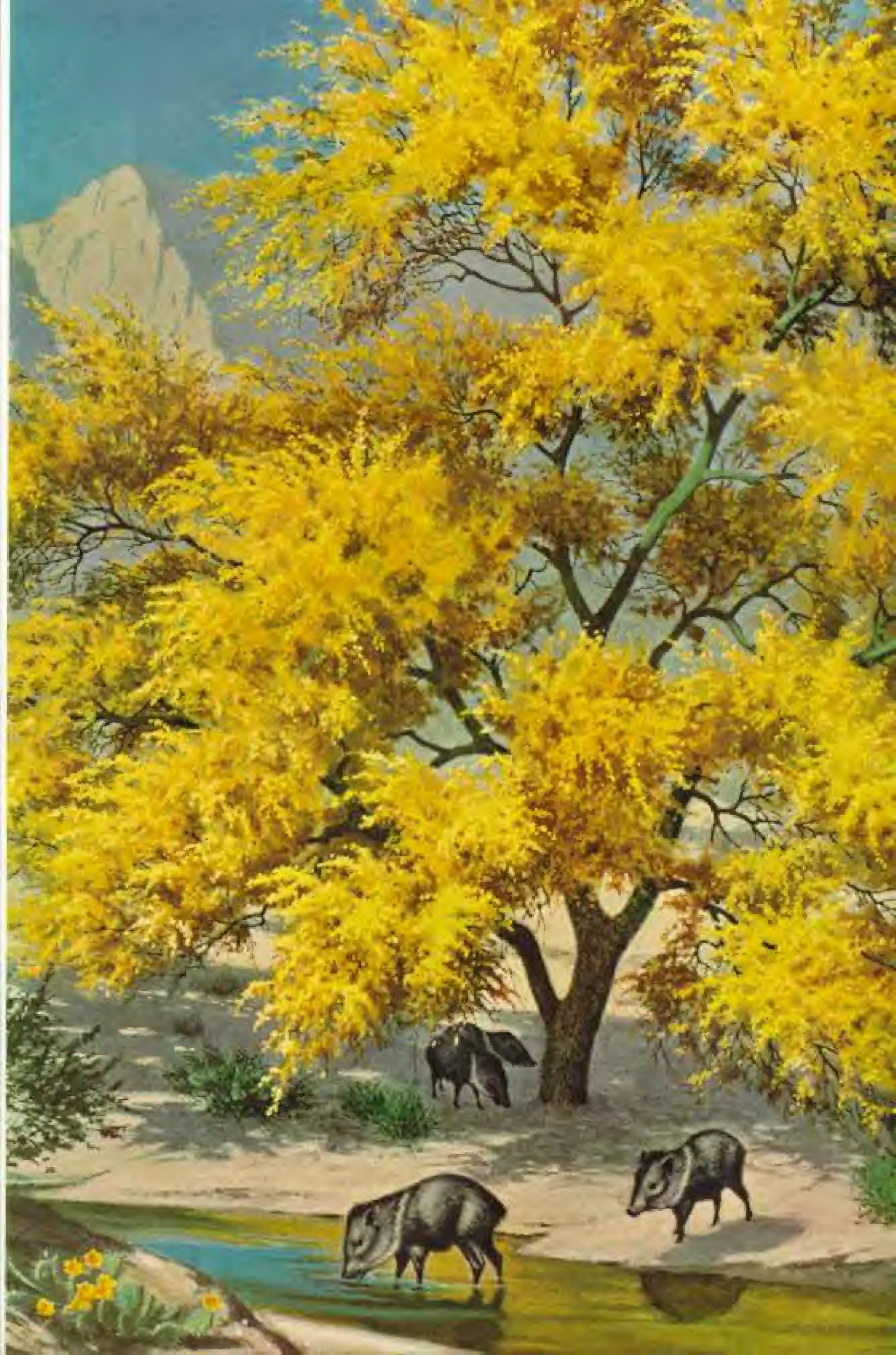
✦ Five-petaled flowers are 2 to 5 inches long; red spots often sprinkle the top petal. Twigs are armed with small thorns. Pod sheds 1 to 8 seeds in midsummer. Corrugated bark is blue green.

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Illustrations by National Geographic Artist Walter A. Wilder

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Coast Redwood Towers Above All Living-Things

(State Tree of California)

THE world's tallest known tree stands near Dyerville, California. Called the Founders Tree, it lofts its green crown 364 feet into the sky. Its soaring, columnar trunk is so massive that it takes seven men with arms outstretched to encircle it.

The Dyerville tree is a redwood (*Sequoia sempervirens*), known too as a California or coast redwood. Its genus, including redwood's only surviving next of kin, the giant sequoia (*Sequoia gigantea*), boasts trees thousands of years old. The General Sherman sequoia in Sequoia National Park, whose girth is two and a half times that of the Founders Tree, has an estimated age of 3,500 to 4,000 years.

Indians Thought Big Trees Immortal

Such dimensions of size and age naturally inspire awe. Some of the Indian tribes who lived in these seemingly immortal forests even lacked a creation myth; they thought the world had always been thus. They raged when white men molested their sacred trees.

Aptly, the Austrian botanist Stephan Ladislaus Endlicher in 1847 gave this genus an indigenous American name. He honored a Cherokee chief, Sequoyah, who devised a written language for his people.

The range of the coast redwood is highly restricted: a strip only one to 30 miles wide, but running nearly 500 miles from Curry County in extreme southwestern Oregon southward to Monterey County, California.

This narrow belt on the Pacific slope, mostly below 2,000 feet in elevation, enjoys a rainfall of 30 to 60 inches in autumn, winter, and early spring. Summers bring dripping fogs and cooling northwesterly winds. Year round, the climate is characterized by mildness, rarely freezing and rarely exceeding 80°.

Man's first recorded encounter with this majestic forest came on October 10, 1769. On that day Father Juan Crespi, chronicler of the first overland Spanish expedition on the California coast, made an entry in his journal describing the "very high trees."

Seven years later one especially tall tree—"un palo alto"—caught the notice of another Spanish traveler. This living tower still stands, giving a name to Palo Alto, California, and an insignia to Stanford University.

Hardly old Father Junipero Serra, founder of the early California missions, grew so fond of these great trees that he requested burial in a redwood coffin.

Viewed singly, a veteran redwood commands respect. At its base it may be heavily buttressed with great knuckles. These help a relatively shallow root system support the tree's immense weight.

High above the forest floor, horizontal or somewhat drooping branches grow from a gently tapered trunk; the crown is open and often rather narrow. Foliage somewhat resembles that of the southeastern bald cypress, but the redwood is evergreen.

Remarkably free from insect and fungus



Lofty Redwoods Thrive in the Cool Fog Belt Edging the Pacific →

← Sharp-tipped needles are about 1/2 inch long, dark green and grooved above, whitish beneath. Flowers appear in winter. Male bloom (center, above) is smaller than the scaly female flower (right, above), which ripens into a cone during the first year.

Cones, 3/4 to 1 inch long, hold 2 to 3 seeds under each scale.

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Paintings by National Geographic Artist
Walter A. Weiss





Redwoods Raise a Sylvan Temple in California

Sequoia sempervirens, growing in the Eel River Valley, is taller but thinner than its cousin of the Sierra Nevada, *Sequoia gigantea*.

injuries, redwood also resists fire. Its furrowed, fibrous bark, 8 to 12 inches thick, provides a good measure of natural insulation. Severe and repeated fires may cause cavelike "goose pens," but even a damaged tree can still live on for centuries.

Insect resisting, redwood is in much demand as lumber. Redwood shingles turn rain with great endurance. Durability and lightness fit redwood for use in sills, sashes, doors, and other millwork. Even its bark is sometimes used—to insulate water heaters.

The wood's beauty makes it popular for furniture and interior paneling. Sawnwood is almost white; heartwood varies from a cherry color to a rich mahogany hue. Large burls of intricate grain yield ornamental table tops.

In early days redwood furnished spars for ships that rounded Cape Horn, wharf piles for young Pacific ports, cradles for frontier babies, writing slates for pioneer schools, beams for churches, and ties for the railroad that united the Nation.

Its very versatility has endangered the redwood. In 1948 redwood stands were estimated at scarcely one-third of the original forest. In one year alone, early in this century, 660 million board feet went the way of Walt Whitman's dying redwood: to "the music of choppers' axes, the falling trunk and limbs, the crash, the muffled shriek, the groan. . ."

Today both the California and Federal Governments, as well as private groups, safeguard our redwood and sequoia heritage. The National Geographic Society 40 years ago helped buy and preserve the famous Giant Forest in Sequoia National Park.

Fifty Flamingos March in Formation in a Bahamian Garden,
Performing an Extraordinary Drill to Human Command

BY CARLETON MITCHELL

With Illustrations by National Geographic Photographer B. Anthony Stewart

"PARADE!"

At the command, 50 heads came erect, eyes front. Feet shuffled and bodies jostled as places were taken.

"Muster!"

The leaders advanced from the pool and crossed the parade ground, a grassy amphitheater surrounded by tropical foliage.

"About turn!"

In perfect unison, the platoon wheeled. Black-visored beaks bobbed in the sun. Knees lifted high in approved drill fashion.

Sitting with other visitors in Nassau's Ardastra Gardens, I thought of the old farmer on his first visit to a circus: after staring transfixed at a giraffe for a long time he exclaimed, "There *still* ain't no such animal!"

Usually Shy Birds Show No Fear

Even as I watched the exhibition I could hardly believe it. For the "soldiers" before me were flamingos, among the shyest and most retiring of birds.

Several times over the years I have seen wild flamingos at a distance, in the desolate reaches of Andros and Great Inagua Islands in the Bahamas. Once, while a Windward Passage gale whistled through the rigging of our ketch *Carib* in a lonely bay on the northwestern corner of Haiti, an exhausted bird tried to alight on the bowsprit. But now I was watching flamingos obey commands in a formal garden, performing within inches of strange humans.

"Charge!"

At the order, the flock began to run in a large circle, each bird holding its wings high and away from the body, displaying the black feathers beneath. With sunlight glowing on their pink-hued wingtops and bodies, it was a beautiful and awe-inspiring sight.

"Halt!" The birds stopped before the visitors. "Now you may take close-up pictures," Hedley Vivian Edwards, their trainer, told us.

He is probably the only man in the world who can offer such an invitation. Flamingo

colonies have been disrupted and nests abandoned because photographers tried to get near enough to use even telephoto lenses.

Actually the birds were too close for me to photograph from my chair. A picket fence of flamingo heads weaved and bobbed above mine. The full-grown West Indian male (*Phoenicopterus ruber*) may stand nearly six feet tall when he extends his long neck. Although none of these young birds had attained full stature, all towered over the seated onlookers.

The flamingo has a bill several inches in length, the upper mandible hooked almost as if broken. Like a boxer with a crooked nose, he looks formidable at short range. Others must have shared my apprehension, because Mr. Edwards said reassuringly, "The birds are perfectly gentle."

Cameras clicked. Behind me rose a wail as a small boy was restrained from darting out to pet the birds.

Flamingo Named for Ancient Myth

The name given to the flamingo genus, *Phoenicopterus*, harks back to the legend of the phoenix, the miraculous bird of ancient mythology. There was only one phoenix, a bird of great beauty. It lived for 500 years in the wilds of Arabia, then lit its own funeral pyre with the fanning of its wings, and from its own ashes arose reborn.

Through the centuries the phoenix legend has survived in both pagan and Christian literature, and the bird has become a symbol of resurrection and immortality. Early in the Christian Era men identified the flamingo with the phoenix, probably not only because its color was that of flame in the sunset sky, but also because in flight it formed the figure of a cross.

The scene in Ardastra Gardens seemed even more incongruous as I thought of the flamingo's normal habitat. The "Flamingo World," as it is called by Robert Porter Allen in his monumental research report compiled for the National Audubon Society, is "a shallow lake, its waters brackish to heavily



saline. . . . It is isolated, desolate of aspect and lies in a remote corner of a sterile and desert-like region inhabited by few animals . . . even the bacteria in the mud must be able to live in an environment that becomes excessively saline and extremely hot. They must have a heat hardiness . . . and survive occasional or periodic drought. . . ."

Ornithologists believe flamingos choose such desolate homes not simply because they prefer them to any other or can find food only in salty slime, but for "no reason other than the retiring nature of these gentle birds." In the words of an Argentine observer, South American flamingos are attracted to the Patagonian lakes because they are "*solitarios y tranquilos*"—lonely and tranquil.

Flamingos fear and avoid men most of all, but apparently they are unable to compete successfully even with other birds and animals.

Places Everybody! First Act!

Yet the birds in Ardastra Gardens actually seemed to enjoy performing in front of humans! Before the drill, Mr. Edwards gave a short talk, telling us something of flamingos in general and his flock in particular. As he spoke, I watched the birds in the pool at the end of the garden. They seemed to be following his words and to know exactly what was being said:

Some pretended to be feeding but obviously were putting on an act, as they kept peering at the audience. Others frankly primped and preened, smoothing a feather here and there. Still others strutted proudly.

As the talk neared its end there was an unmistakable excitement, like the nervous tension in the wings of a theater before the curtain goes up. There was even a bit of jockeying for position, to be first on stage.

Hedley Edwards's final words to us were: "If you enjoy the drill, please be generous

with your applause. The birds work better."

As they marched and countermarched, the flamingos flowed through fascinating and never-repeating patterns of form and color. The movement of their heads and necks was somehow reminiscent of swans, but more graceful. I was aware of kaleidoscopic patterns against the green backdrop of tropical shrubbery, but they changed so swiftly none could be captured in memory.

The fleeting impressions of beauty and delicacy made me think, too, of a ballet. Despite the military nature of the orders and evolutions, suddenly I saw the flamingos of Ardastra Gardens as dancers, members of a precise and well-drilled chorus—ballerinas in pink feathers. And no human ballerinas could be more anxious to be admired, more graceful in performance, more audience-conscious—or more desirous of applause.

At the final order of "Dismiss, retire!" the flamingos dashed for their pool to a spontaneous burst of clapping. Immediately they seemed to assume the nonchalance of old troupers, but I thought I detected speculative looks at the dispersing audience, counting the house, and glances of a "How-did-we-do-boss?" nature toward Mr. Edwards. Nor did they shy away as visitors moved close to take more pictures. The flamingos of Ardastra Gardens were not only ballerinas, but prima donnas—and hams! They loved it!

Ancient Artists Drew Birds of Flame

The earliest known rendering of a flamingo by a human artist is a Neolithic cave drawing in Spain, of approximately 5000 B. C. In Egyptian hieroglyphics the flamingo, or phoenix, stands for the color red; the bird was revered as the embodiment of the sun-god, Ra. It was described as "very handsome with wings as crimson as flame" in a Greek play written by Aristophanes in 414 B. C.

Apparently the ancients appreciated the beauty of this noble bird. But man's association has also proved disastrous. As Robert Allen puts it: "...man, that immense and paradoxical figure in whose eyes alone beauty can appear, and who alone can trample it underfoot and destroy it utterly."

Before the birth of Christ, it is said, Phoenicians were trading dried flamingo skins to

◀ Nassau's Performing Flamingos Enjoy a Siesta While Balanced on One Leg

Twice a day visitors to beautiful Ardastra Gardens on New Providence in the Bahamas witness an extraordinary display. Fifty pink flamingos, normally shy and nervous birds, drill like soldiers at their trainer's command. Performing within inches of strangers, they stand at attention, mark time, march, and do a quick about-face, all in perfect unison.

Long necks curled back, heads tucked in feathers, these five birds nap in a shallow lagoon.

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* "The Flamingos: Their Life History and Survival," by Robert Porter Allen, published by the National Audubon Society, New York, N. Y. Copyright 1956.

**At the Order "Parade!"
Eager Actors March In
Without a Sign
of Stage Fright**

Orchids festoon the trees and jasmine scents the air in Ard-natra Gardens. But flamingos are the undisputed stars of this Nassau show place.

"These birds are gentle," the rock at pond's edge reminds guests. "Be kind and noble and enjoy your visit with them."

No human performers could be more anxious to be admired, more audience-conscious, or more desirous of applause.

Even as trainer Hodley Edwards introduces the act, the birds jockey for position in the water to be first on the parade ground. Like players awaiting their cues in the wings, they stand tense, some gabbling excitedly.

Drillmaster's call brings the troupe scurrying to the center of a grassy amphitheater. "Muster!" comes the order. The show has begun.

**✦ Living Question Marks
Strut on Webbed Feet**

Heads held high, eyes to the front, marchers high-step slowly and gracefully around the arena.

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MUSEUM OF NATURAL HISTORY

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the semibarbarians of Cornwall for tin and to tribes in the Low Countries for amber. They represented them as phoenix skins, hence as talismans of immortality.

In the first century A. D. the thick, oily tongue, properly pickled, was a delicacy necessary to every notable Roman banquet. Pliny recorded in his *Naturalis Historia* that "Apicius, the most gluttonous gorgier of all spendthrifts, established the view that the flamingo's tongue has a specially fine flavor."

Thus these lovely birds of the Mediterranean and Black Sea shores (*Phoenicopterus antiquorum*) were hunted almost to extinction.

The same fate threatened flamingos of another world when European civilization moved westward across the Atlantic. There were large flocks in various West Indian islands, in South and Central America, and in Florida. The accessible rookeries were soon invaded; adult birds were shot, young birds and eggs taken from the nest. As a single intrusion might cause thousands of birds to abandon their incubation area, attrition was rapid.



Flamingos bagged by market hunters were openly sold in Florida past the middle of the 19th century. Only the fact that the color fades rapidly from the feathers after death saved the more remote flocks from those most ruthless of killers, the plume hunters.

Through a long chain of circumstance, the flamingos I saw in Ardastra Gardens were there because the species had been in danger of extinction in the Bahamas.*

Air Age Threatens Remote Flocks

In recent years a new enemy has been added—the airplane. During World War II, pilots training near Nassau discovered the flamingo "cities" on Andros Island, little more than 30 air miles away. Previously these nesting colonies were difficult to reach, lying behind an almost impenetrable barrier of intertwined mangrove trees, bogs, tidal lakes, and virtually solid clouds of biting, stinging insects. But the flying students could vault over these natural defenses. They "buzzed" the birds to see them lift in pink clouds, and there are even reports of strafing.

"The flamingos of Andros vanished," Arthur S. Vernay, president of the Society for the Protection of the Flamingo in the Bahamas, told me. "We don't know exactly what happened; they just gradually disappeared. No other colony increased in size during that period; in fact, all declined. It

* See "Flamingos' Last Stand on Andros Island," by Paul A. Zahl, NATIONAL GEOGRAPHIC MAGAZINE, May, 1951.

"Halt!" The Squad Freezes at the Word →

"Camera fans, you may now take all the pictures you want," the trainer advises as the birds stand fast in front of the audience. Photographers, quick to take advantage of the offer, snap close-ups from all angles.

Not yet fully matured, these West Indian flamingos stand just under six feet with long necks fully extended. Colors darken with age; grayish necks and heads turn successively pinker. The brightest pink appears on neck, underwings, and breast. Small yellow eyes and a humped beak tipped with black give the bird a perplexed look.

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Ardastra: photo by E. Anthony Warner; flocks and Kachelirain: by Anne Jervis Quarrier

← "Everybody's Out of Step but Me"

Almost every army has its nonconformists, and Ardastra's flamingo battalion proves no exception. Miss Bester, "the flamingo that refuses to be regimented," is a recognized prima donna and, as such, enjoys herself hugely. Here she strolls nonchalantly behind the circle of onlookers as fellow performers parade obediently inside the ring.



is difficult to say whether the Andros birds were literally frightened to death or simply stopped nesting."

By the end of the war there were probably fewer than 5,000 birds in all the Bahamas, most of them in the desolate brine lakes of Great Inagua Island, which lies closer to Hispaniola than to Nassau. Even here the population was declining, partly because of poaching, partly because of wild hogs.

Fortunately, the Bahamian society devoted to their well-being was formed in 1951, in time to turn the tide. Primarily through private contributions, wardens were hired to protect the nesting sites from predators, including man; legislation was reaffirmed in the Bahamas' House of Assembly outlawing the killing of birds for food and the taking of eggs; and finally both military and civilian pilots were forbidden to fly over flamingo nesting sites at less than 2,000 feet.

There are now at least 15,000 birds on Great Inagua. Recently there have been reports of flocks trickling back to Andros.

"About two years ago Hedley Edwards asked the society if he could have a few birds for display in the gardens," said Mr. Vernay. "We flew nine young birds from Great Inagua, then later an additional fifty. These are the flamingos you are now seeing, although none of us dreamed they could be trained. One day about a year ago Mr. Edwards called and invited me to a 'performance' he was going to put on. I was amazed—and now you can see for yourself."

Gangling, Grotesque, Yet Graceful

Sitting in the brilliant April sunshine, I watched the flamingos feeding in their pool. Flamingos are birds of great dignity, yet can contort themselves into positions which can only be called ridiculous. They are lovely in coloring and form, yet somehow their long legs and necks make them grotesque. In appearance they are delicate, but according to Robert Allen are "strong and able flyers, capable of long and sustained migrations that on occasion may carry them . . . even from one continent to another."

The great birds are generally thought of as indigenous to tidal waters, yet they range from semideserts below sea level to nearly 15,000 feet altitude in the Andes. Perhaps it is such contradictions that make them so fascinating to study and to watch.

Contrary to the normal among birds, in

the flamingo the lower mandible—the bottom part of the bill—is fixed, while the upper moves. But the flamingo emphasizes its nonconformist character by eating with its head upside down: the long flexible neck thrusts far out from the body, and then the bird feeds back toward its feet. This puts the upper mandible underneath.

Nature's reason for the hooked curve in the bill becomes apparent: the upper half thus can fit against the bottom, where it can scoop up organic material on the mud.

A feeding flamingo opens and closes its mouth forcefully, taking in and ejecting water. Simultaneously there is a pumping action produced by throat and tongue. Jets of water are forced out at the corners of the bill after being screened of food content by tiny strainers on the mandibles and by rows of fleshy teeth on either side of the tongue. These Dr. William Beebe has described as being "in shape exactly like the poison-fangs of a rattlesnake."

Performers Relish Boiled Grits

"What do you feed your flock?" I asked Hedley Edwards.

"Boiled yellow grits, calf feed, and shrimp meal," he answered and smiled. "They are real Bahamian birds—they eat grits. Along with peas and rice, grits are a favorite dish in the islands."

I knew that the coloring of a flamingo depended greatly on diet. Wild birds eat tiny mollusks, small crustaceans, microscopic organisms, aquatic insects, and marine worms.

Into my mind came a picture that has never faded, one of the most vivid recollections of my life. After a rough passage across the Tongue of the Ocean in *Caribbee*, successor to *Carib*, we had anchored in Middle Bight, Andros. The heavy black clouds of a norther were to the west and north, but toward sunset the wind dropped. Under us the water lay flat, steely gray.

As we sat in the cockpit watching the sun lower beneath the overcast, suddenly a flight of flamingos appeared. With their long necks stretched ahead, and equally long legs rigidly horizontal behind, they looked like scarlet javelins tipped with black. None of us moved or spoke. The flock settled in shallow water at the end of a small cay, perhaps half a mile away, and began feeding. Through binoculars we could see them clearly

(Continued on page 569)



Fresh from the Bath, a Preening Female Buries Her Beak in Pale Pink Plumage.

This rare beauty calls to mind the leather boas and gaily plumed hats of the late 19th century. Flamingos were spared by the ruthless plume hunters, however, because their color fades rapidly after death.



↑ "Charge!" Birds Circle the Arena at Full Speed with Wings Extended

Hedley Edwards began training his flamingos when they were four months old. For more than a year they worked behind closed doors. Their first exhibition brought instantaneous praise.

How did Mr. Edwards teach the birds? That secret remains his. But he is known to lavish tender care. "These birds are just like my children," he says.

Climaxing the half-hour show, this mad dash calls to mind the children's game of crack-the-whip. Outside runners must travel much faster than those in the center. Occasionally they trip and fall, but bounce up quickly.

→ "About turn!" Mr. Edwards commands. The entire company pivots as one and charges in the opposite direction without missing a step.

← Queenie (left) and Rex sunbathe on the green after a dip.







Spectators Meet the Stilt-legged Cast Face to Face During an Intermission

"Ladies and gentlemen, please save your applause for the birds," trainer Edwards advises before each show. Praise seems to drive the performers to greater effort; they dislike playing before empty chairs.



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Birds Return Stare for Stare. Black Beaks Are Aligned as if by a Magnet

Wild flamingos disrupt their colonies and abandon nests if photographers approach too near. In contrast, Mr. Edwards frequently assures nervous visitors that his pets will not harm them.

"Dismiss! Retire!"

Warm, Thirsty Birds Dash Back to the Pool

So rapidly do the flamingos execute their routines that visitors miss many of the birds' wonderfully strange contortions. High-speed photography reveals movements that escape the eye.

Performers waste no time in returning to the lagoon. Eager to bathe and preen, some birds half-fly, half-jump several feet above the ground.

Opposite, lower left: Neck tucked back in folds, a female smooths stray feathers.

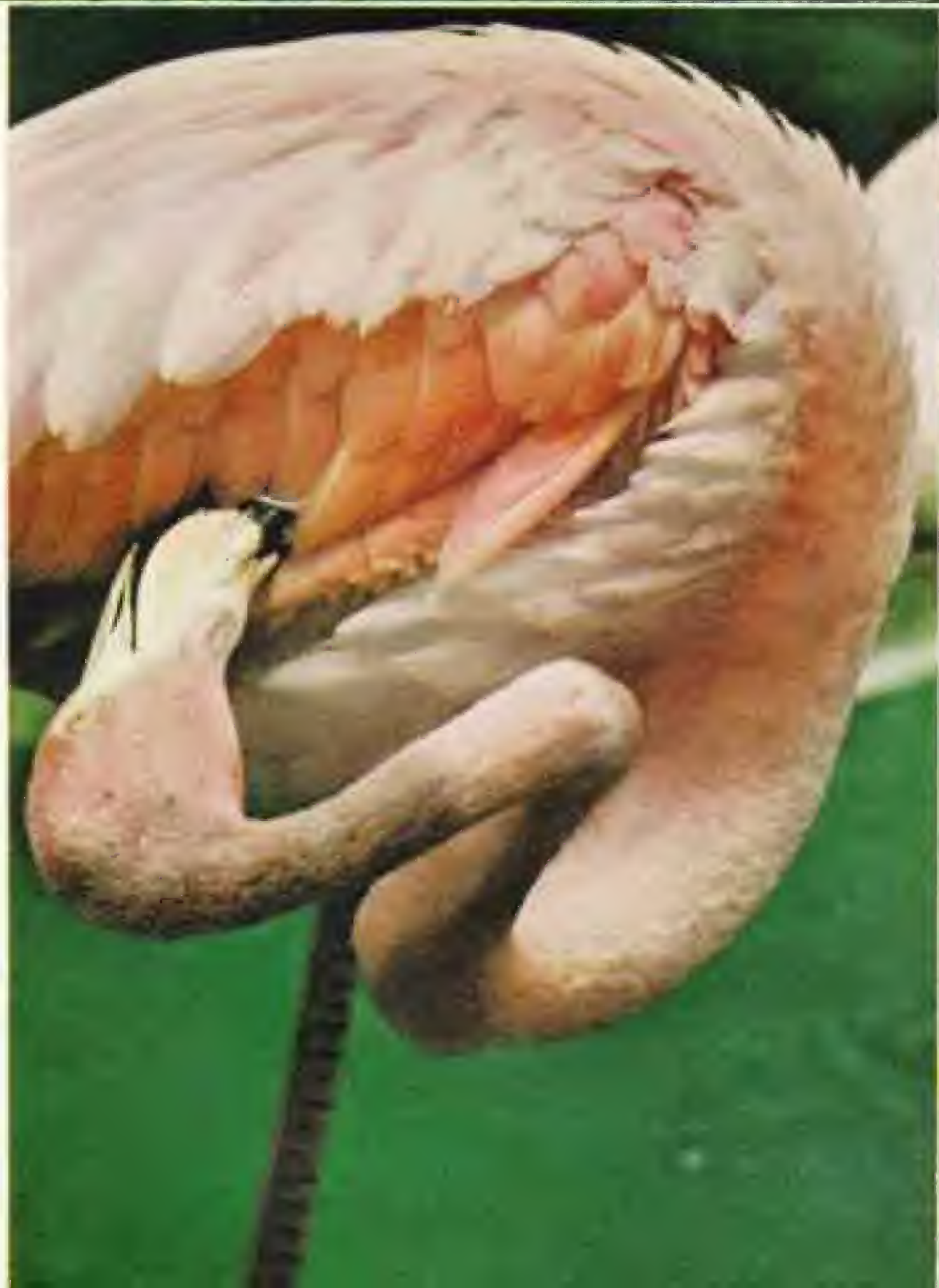
Lower right: Inverting its beak in the shallows, the flamingo eats upside down. The mandibles act as filters, straining out sand and water but retaining tiny marine organisms. † The heavy-bodied flamingo can swim with ease if compelled but prefers to feed in shallow water. This male flaps his wings violently to splash up water for a bath. Extended wing shows the deep black quills on the edge.

© National Geographic Society

Melville Bell Grosvenor—A

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Ardastra's Stars While Away Off-stage Hours in Their Beauty Baths

Few of nature's creatures can boast a coat as lovely as the flamingo's. As if fully aware of its heritage, the bird spends hours preening and primping.

◀ Rex dries ruffled plumes by rubbing his long neck across the wing.

♣ Flamingos apparently differ little from humans in their desire for critical acclaim and audience acceptance.

"Did they like us? Do you think we went over well?" these four males seem to be asking one another in their watery dressing room.

© National Geographic Society

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—lambent flames, pink yet crimson, an incredible shade, brilliant but soft, like no other color in my experience.

Remembering, I asked Mr. Edwards if his flock was as red in coloring as wild birds.

"No," he admitted. "Captive flamingos are never so deep a hue. But we are experimenting by bringing in a type of mollusk found in the brine pans of Great Inagua to add to their food. Also, these are still young birds. They will darken as they grow older."

"Do you hope to raise chicks here at Ardastra Gardens?" I asked.

"Possibly. The flamingos at Hialeah Park near Miami have nested for many years.* My birds are just reaching maturity."

Nesting Birds Sit on High Chairs

Flamingos usually pair at about three years, after complicated courtship ceremonies. Robert Allen describes them as "gregarious, socially cooperative birds," their nests close together, forming true "flamingo cities." The larger the colony, the more successful, even to the survival chances of the chicks.

Nests are mounds of marl or mud, averaging almost a foot high, a foot in diameter at the top, and about twice that at the base—in other words, a conical pyramid, or hillock, flat and slightly hollowed at the apex.

The posture of incubation was a matter of argument and misconception for centuries. In 1697 William Dampier, a full-time seaman, part-time buccaneer, and part-time naturalist, reported in *A New Voyage Around the World* that flamingos while hatching "stand all the while, not on the Hillock, but close by it with their Legs on the Ground and in the Water, resting themselves against the Hillock, and covering the hollow Nest upon it with their Rumps; For their Legs are very long; and building thus, as they do, upon the Ground, they could neither draw their Legs conveniently into their Nests; nor sit down upon them otherwise. . . ."

This belief that flamingos nest tripod fashion, legs out ahead while balancing on the after part of their bodies, modern ornithologists call the "Dampier myth." For the record, flamingos usually lay a single egg and perch on top of their mud pile almost exactly like a mother hen, except that their long legs stick out behind like a pair of curtain rods.

Female and male take turns on the eggs. Frank M. Chapman in *Camps and Cruises*

of an *Ornithologist*, a book I almost memorized as a small boy, quotes his Bahamian guide as saying: "I do tink, sir, dat when de lady Fillymingo leave de nest, den de gentleman Fillymingo take her place, sir."

The hatching period is about four weeks, a long dull period for the parents and any naturalist watching from a concealed blind.

"The incubation phase in an active flamingo colony embodies one of the rarest spectacles in the avian world," wrote Robert Allen, "and, at the same time, can stretch on into infinite boredom, for observer and incubating bird alike. The first distant view at this stage is breathtakingly beautiful and completely improbable—an island of immense size, shimmering like flame in the hot sunlight. . . . At closer range it becomes a vibrant, vigorous creation, alive with ravishing color, mass motion and unnerving sound. But . . . if you settle down to watch . . . hour after hour, and day after day, it is a different matter entirely. The beauty and the wonder remain, but the sum total of a single day's activities is soon entered in your notebook."

Chicks Struggle to Hatch

But then comes the day when the chick begins to move in the shell. Hatching is a difficult process, with high mortality. The egg shell is tough and the tiny chick weak. The battle for life is painful and uncertain. The chick struggles until exhausted, rests, and tries again. The parent bird stands by, unable to help, although watching intently and occasionally touching the young bird with its bill. Sometimes a parent becomes so nervous it cannot watch, but walks away. The emergence usually takes about an hour, but is frequently longer.

The baby flamingo is short-legged and short-billed and looks much like a young goose. As soon as possible it is fed in the nest from the bill of a parent bird, but later is tucked under a wing at mealtime.

When about ten days old the chick first begins to resemble an adult of its species: the mandibles lengthen and curve, and the legs elongate. It becomes a true ugly duckling, flamingo version. It is awkward, with disproportionately thick stilt legs and oversized feet; the bill begins to hook, but is not yet formidable; the feathers are dull gray.

* See "Flame-Feathered Flamingos of Florida," by W. A. Watts, *NATIONAL GEOGRAPHIC MAGAZINE*, April, 1941.



Heads Bobbing, Pipestem Legs Bending at the Knees, the Company Passes in Review

At about five weeks the worst happens. Adult plumage begins to appear. Then the youngster is a patchwork of gray, black, brown, and faintly pink feathers, an unsightly caricature of its elders in both form and color. Only a mother could love it—and doesn't. She moves out. The young birds club together, strictly on their own.

Hurricanes Blow the Birds Down

Shortly after the end of the second month the young birds begin to fly and gradually develop into objects of grace and beauty. To attain this degree of maturity, they have survived man and such natural hazards as predators and heavy rains.

Other dangers remain, probably the greatest being hurricanes. A severe storm can wipe out every flamingo in its path. Some are

literally torn apart by the fury of the wind, some are crushed by being blown against trees or other unyielding objects; some are drowned in their ponds by rising waters, and still others are blown to sea.

On September 24, 1849, a lone flamingo appeared in Bermuda. It is believed to have been carried by hurricane winds from Great Inagua, nearly 900 miles away. In over a century since then, only one other flamingo has been seen in Bermuda, after a 1909 gale. Remembering the dazed exhausted bird which tried to rest on *Carib's* bowsprit in Haiti, I feel countless flamingos must be swallowed in the ocean wastes during every great storm.

"How long will your birds live?" I asked Hedley Edwards.

"Flamingos in captivity have been known to live twenty years," he replied. "Ours are



A Swift Young Sergeant Drills the Team

pinioned when young so they cannot fly away. I try to keep them healthy, well fed, and content. They seem to enjoy their work."

I agreed. By now most of the visitors who had come to see the flamingos perform had left or were wandering along the paths looking at the flowers and trees. We sat alone watching the antics of the birds in the pool. Some dozed, resting for the next curtain call; each napper tucked its head under a wing, a perfect protection against morning glare (page 554). Others preened, or lazily strained a snack from the pond.

"How did you happen to start Ardastra Gardens, and what does the name mean?" I asked.

"It is from the Latin *Per ardua ad astra*, 'by labor to the stars.' My bishop suggested the name," Mr. Edwards answered.

"When I came to the Bahamas from Jamaica in 1924, I had had training in tropical gardening. There was no place in Nassau with examples of all the plants, flowers, and trees that could be grown. So about 20 years ago I got this property and started work. There was nothing here. I planted and landscaped, dug the pool, and built paths. It took a long time for things to develop. But even after the gardens were beautiful, few people came.

"Finally I asked Mr. Vernay to let me have flamingos to show people who might never see them in nature. The society furnished the birds you see there in the pool."

Drillmaster Keeps Training a Secret

"But how do you manage to train them?" I asked at last.

Mr. Edwards smiled mysteriously. "Here, let me show you my visitors' book," he said.

"Remarkable" was the first notation I read. "Most extraordinary," wrote another. A retired colonel of infantry penned boldly: "Unbelievably impressive even to a man who has spent his life watching precision drills." Similar comments filled pages.

"But how did you teach your birds to obey your commands?" I repeated.

He smiled again. "I'm sorry," he answered, "but it is a training secret I cannot divulge."

Later Arthur Vernay gave me his opinion: "Hedley Edwards has lived with those birds ever since they came from Great Inagua at four months of age. They have grown to depend on him and trust him. If permitted, they follow him everywhere.

"I think the first responses were probably accidental, but he saw the possibilities and had the patience and ability to exploit them."

Perhaps. But in the visitors' book is a comment by Dr. Robert Cushman Murphy of the American Museum of Natural History, one of the world's foremost ornithologists. He wrote: "Mr. Edwards is the only man since Noah whose language is understood by the birds!"

Gypsy Cave Dwellers of Andalusia

THE cave, refuge of primitive man, still serves as home to surprising numbers of people. In Spain entire communities live below ground, particularly in the southern provinces where soft limestone, clay, and loam yield easily to pick and shovel and where many natural caves are found.

Gypsies who have forsaken nomadic ways seem especially drawn to such unconventional dwellings, although many non-gypsies live in them as well. In Granada the gypsy troglodyte colony ranks next to the Alhambra as an attraction for visitors.

✦ A cave need not be primitive, as this kitchen scene testifies. Well-tamped floor, whitewashed walls, and attractive furnishings readily make a cave a home. Doorways and ceilings are arched for strength.



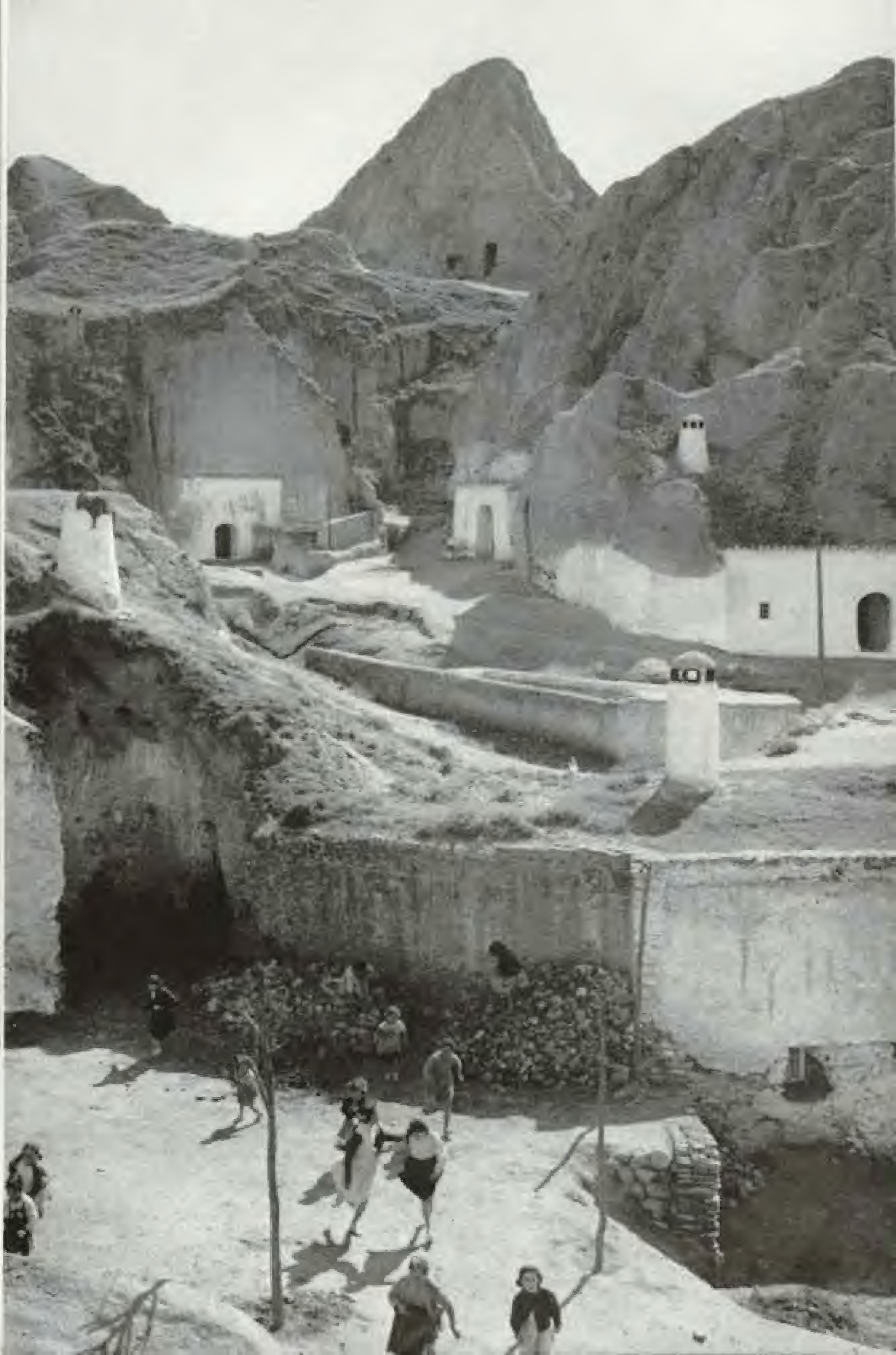
© Jack Steinhilber, PMA

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Doorways Dot the Hills of Guadix →

Patches of whitewash and domed chimneys like watch-towers betray the presence of cave dwellings. This Guadix suburb shelters an estimated 10,000.









Dark-eyed Gypsy in a Granada Cave Symbolizes the Romance of Spain

Gypsies, whose ancestors presumably came from India, wandered into Spain 500 years ago. Moving in caravans from town to town, they lived as tinkers, coppersmiths, peddlers, horse traders, and fortunetellers.

Andalusia caught the fancy of these itinerant people; they must have felt a kinship with the Moors, who then ruled much of southern Spain.

While many *gitanos* continued to roam the roads, others settled in the region around Granada, then the richest and most powerful city on the Peninsula. In the capital itself, gypsies moved into the Albaicin, the old quarter of the Moorish falconers, or scooped out shelters on the slopes of the Sacro Monte, one of the hills dominating Granada.

Washington Irving saw them there a century and a quarter ago. Standing on the balcony of the Alhambra, palace of the Moorish kings, he heard "the tinkling of innumerable guitars, and the clicking of castanets" coming faintly from the quarter where gypsy dancers, then as now, struck the blood-stirring rhythms of Andalusia.

Today many of the Sacro Monte residents make a living by performing for visitors who climb the steep winding paths to the gypsy caves.

Granada's caverns, a major center of the flamenco art, have produced many of Spain's finest singers and dancers and are responsible for much of the music and color that are typically Spanish. Here the Spanish composer Manuel de Falla and the Russian Mikhail Glinka found inspiration for some of their best-known works.

This gitano girl with her flounced skirt and spit curls stages a *zambra* in her home. Her fingers snap like pistol shots, her heels stamp a fusillade on the stone floor, and her body twists like a palm in a gale. The staccato clapping of her associates and the insistent frenzy of four guitars urge her on.

The dancer's mother circulates with the sherry bottle. "La Faraona," her nickname, means Pharaoh's Daughter and reflects the gypsy notion that the Romany people are of Egyptian ancestry.

A multitude of copper vessels gleams on ceiling and wall like gypsy eyes in the firelight. Such decorations are common in the Sacro Monte quarter; gypsies have always been skilled smiths. One legend relates that their race was condemned to wander the earth because they forged the nails that crucified Christ. And tradition holds that gypsies forged the cannon balls that King Ferdinand fired against the Moors in the siege of Granada.

Late Maestri, National Geographic Staff



Jack Manning/PIA

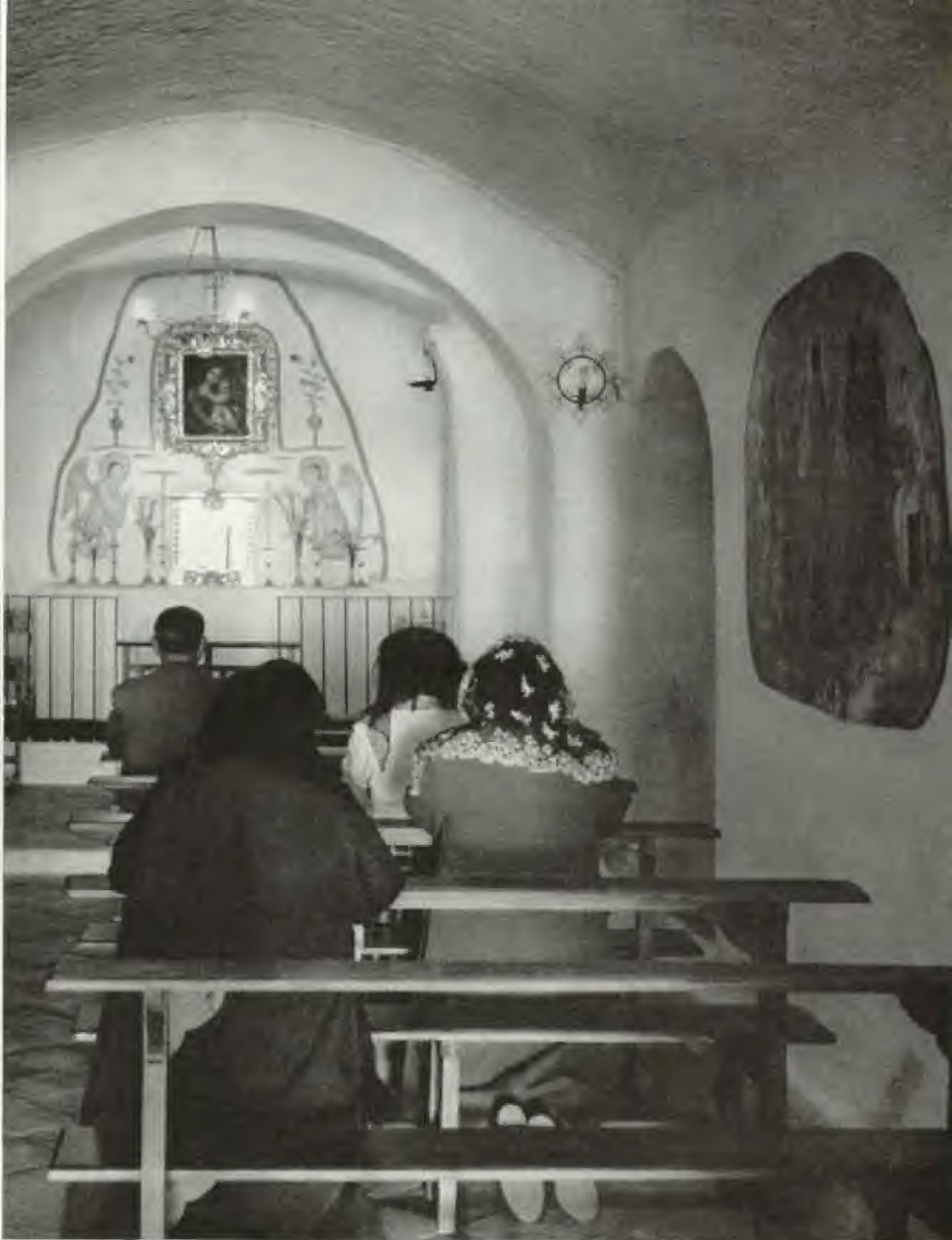
Beds Must Be Made, Even in a Cave



Spain's Highest Mountains Tower Above the Caves

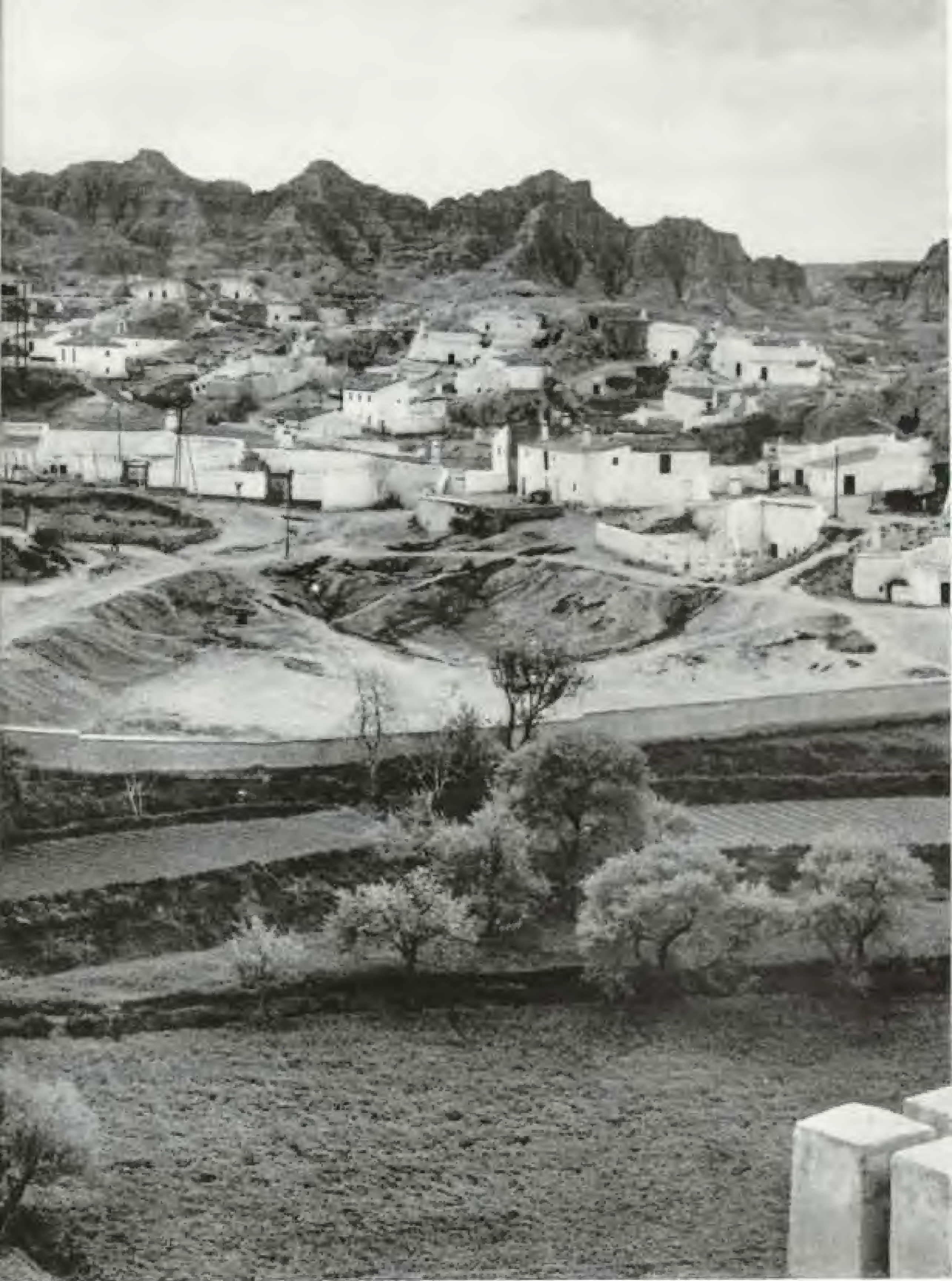
Underground communities dot the Sierra Nevada foothills. Snow-thatched peaks climb well above 11,000 feet.





Guadix Worshipers Say Their Paternosters and Ave Marias in a Grotto Chapel

This city near Granada includes one of the largest troglodyte populations in the world. The cave quarter covers roughly a square mile where not only dwellings but stores, taverns, schools, and churches are below ground. Like the chimneys of the homes, the chapel thrusts its spire above the surface. Many gypsies give special veneration to Sara, legendary Egyptian handmaiden to St. Mary Salome and St. Mary Jacobe.



Cave Doors Stare Like Sightless Eyes from the Barren Hills Around Goadix

The city's name, from the Arabic for Valley of Life, seems a misnomer for so desolate a region. Treeless foothills, rising in a contorted mass of pinnacles, are more aptly known as the "moon-struck landscape."



Crenelated Walls Crown the Alcázar, a Fortress Left by the Moors

Front rooms built out from the slope conceal the entrances to some of the caves. Others frame a simple opening with a façade of wood or brick, protection against erosion in the unlikely event of a downpour.



Jack Morrison, Pir 7-23

Cinco Jueño, Pir

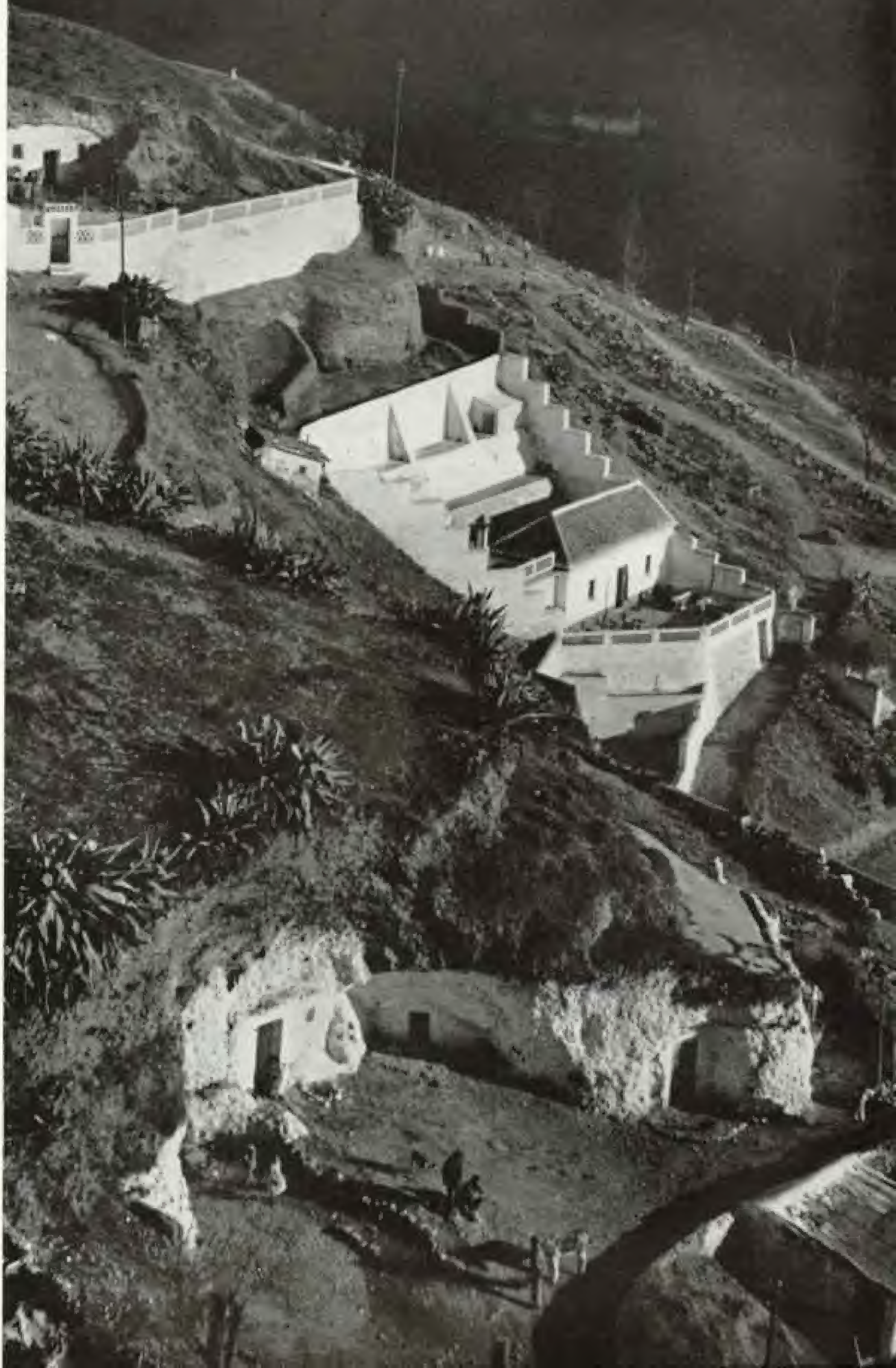


↑ Skies That Seldom Rain Dry Linens Quickly

→ "*Más pobre que cuerpo de gitano*" (poorer than a gypsy's body!), say the Spaniards. Most gypsies still present the traditional appearance of poverty, but on Sacro Monte tourist money has made many of the *gitanos* prosperous.

Homes of the better-known dancers and singers contain baths, electric lights, and telephones. Two of these cave dwellings suggest luxury villas.

In all the underground communities caves vary just as houses do: some have only a single room; others may include as many as 20 chambers. Some are squalid; others are as spotless as tiled floors, whitewashed walls, and an immaculate housekeeper can make them.





Cave Dwellers in La Guardia Live Below Ground by Choice, Not from Poverty

Gypsies and non-gypsies alike regard their cave homes as highly as if they were cottages above ground, though they may boast only a sheet of burlap for a door and a bare rock for a front yard.

In summer's furnace heat the *cueva* is pleasantly cool; the blasts of winter never fully penetrate its depths. A towering chimney ventilates the interior nicely when an open fire burns in the kitchen. And the single entrance discourages robbers. In any case, cost is modest—as little as 700 pesetas (\$14) for a small cave, 10,000 pesetas (\$200) for a large one.

History of the National Geographic

Announcing Publication of "The National Geographic Society and Its Magazine: A History," by Dr. Gilbert Grosvenor

THE story of the growth of the National Geographic Society from a small, struggling organization to a world force for knowledge and understanding has now been told by the one man best qualified to tell it—Dr. Gilbert Grosvenor, for 55 years the guiding genius of The Society and its Magazine.

Looking back over those golden years of editorship, Dr. Grosvenor, now Chairman of the Board, shares with members the rich experiences of one who has roamed the world "with a hungry heart." With a wealth of photographs and anecdote, he recalls the trials and triumphs of building "the magazine with no future"—as scoffers once dubbed the National Geographic—into the world-renowned publication it is today.

The Society's 2,175,000 members make it by far the largest scientific and educational society in the world. But there seemed little portent of startling future growth in 1899 when Gilbert Grosvenor reported to work as The Society's staff of one. Alexander Graham Bell, President of The Society from 1898 to 1903, had asked the 23-year-old schoolteacher to take charge of The Magazine and promote the membership.

Dr. Grosvenor vividly describes his first days in The Society's headquarters—half of a small, cluttered rented room. The treasury was empty and the membership so small that he

Golden Jubilee Found Editor Still at Helm

In 1949, the year this picture was taken, statesmen and scientists all over the world paid tribute to Gilbert Grosvenor's five decades as architect and master builder of the National Geographic Society.

On his roll-top desk, presented to him by Mrs. Alexander Graham Bell early in his editorship, are photographs of his wife, Elsie May Bell Grosvenor, and his son, Melville Bell Grosvenor, now President and Editor.

John E. Fletcher,
National Geographic Photographer

addressed the envelopes: of the first issue he edited and then carried the entire mail edition on his back to the post office in one trip.

But the organization had a mighty asset in the ideas shared by Dr. Bell and the youthful Gilbert Grosvenor: gaining members for a great society, not merely subscribers to a magazine; bringing geography into the homes of the people; transforming The Society's Magazine from one of cold scientific fact into a vehicle for carrying the living, breathing, human-interest truth about the world.

With the rich background of one who has known personally the great explorers of the past 60 years, Dr. Grosvenor tells, too, of The Society's history-making expeditions.

Dr. John Oliver La Gorce, President-Editor 1954-7, now Vice-Chairman, contributes an account of The Society's activities today.

The National Geographic Society and Its Magazine: A History, 196 pages, 175 illustrations, paper-bound in the familiar yellow National Geographic format, \$1.50, postage prepaid. Available only from National Geographic Society, Dept. H, Washington 6, D. C.



TRAVEL QUIZ (FOR OCTOBER)



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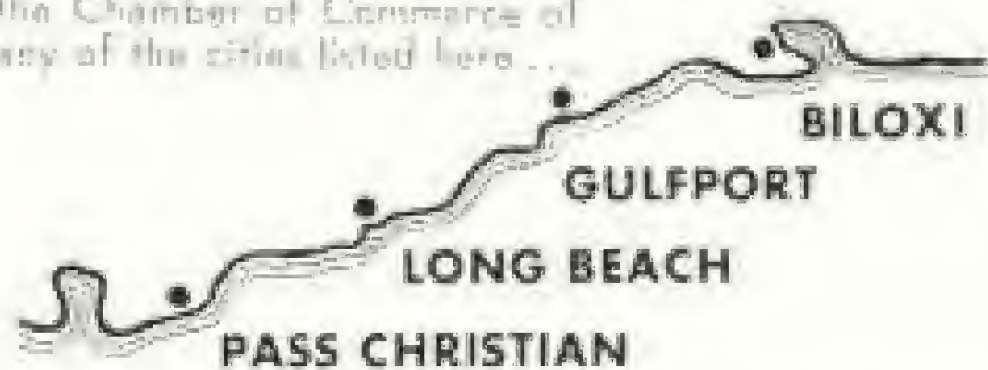
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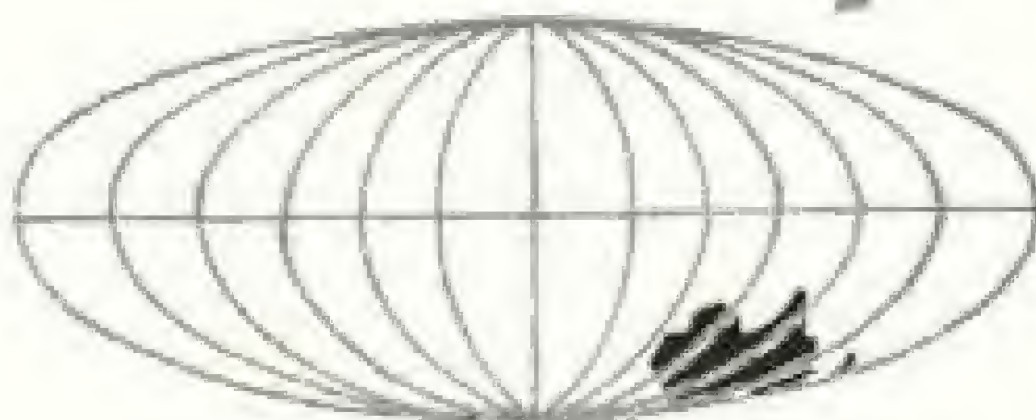


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This is Georgia Melissa. The hotel before which she is standing is her Athenian home in Greece. Her mother occasionally works at straw chair weaving but is never able to find permanent employment. Her father just disappeared. She has four younger brothers. Georgia is amazingly intelligent for a ten-year-old child who hasn't had a dozen weeks in school. She should be given an education as she has great charm and potentialities. As it is, she hardly gets enough to eat.

There is severe unemployment and heart breaking, harsh poverty in Greece. Even many of the children who are helped have only one meal a day and go to bed hungry every night. The bed is some old rags on the dirt floor of a bleak shanty. There isn't much to do in the daytime except to sit and think how hungry they are. There's no use going through the garbage cans, for too many are doing that. And for lack of funds, the relief agency doesn't serve any meals at all on Saturdays and Sundays.

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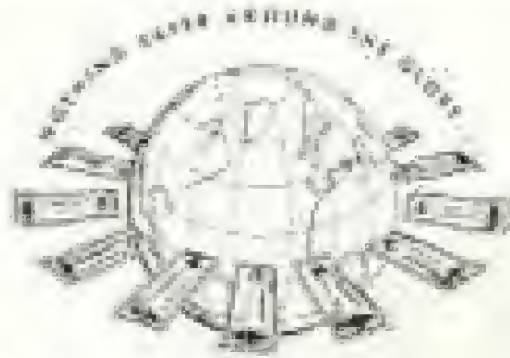
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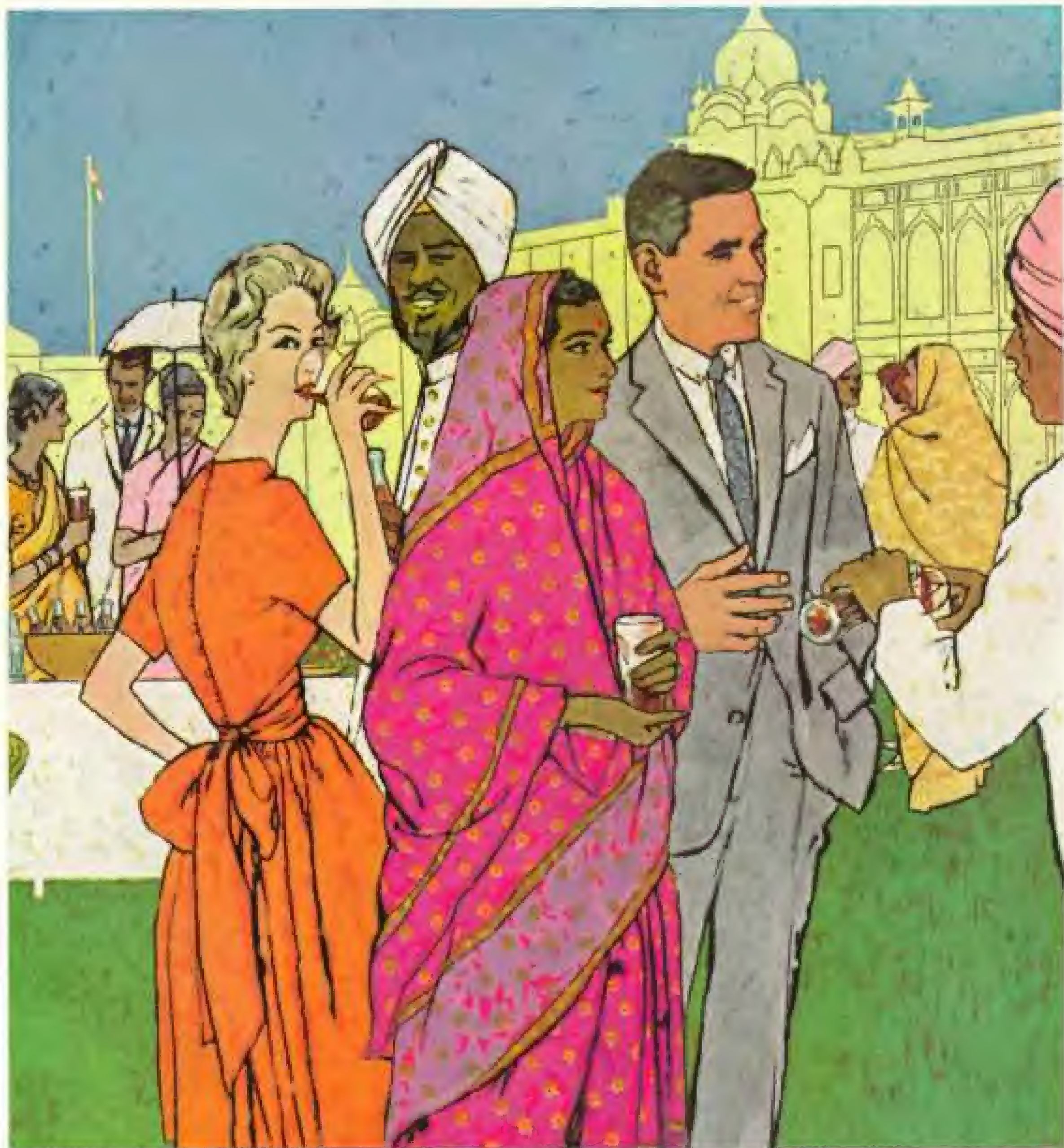
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