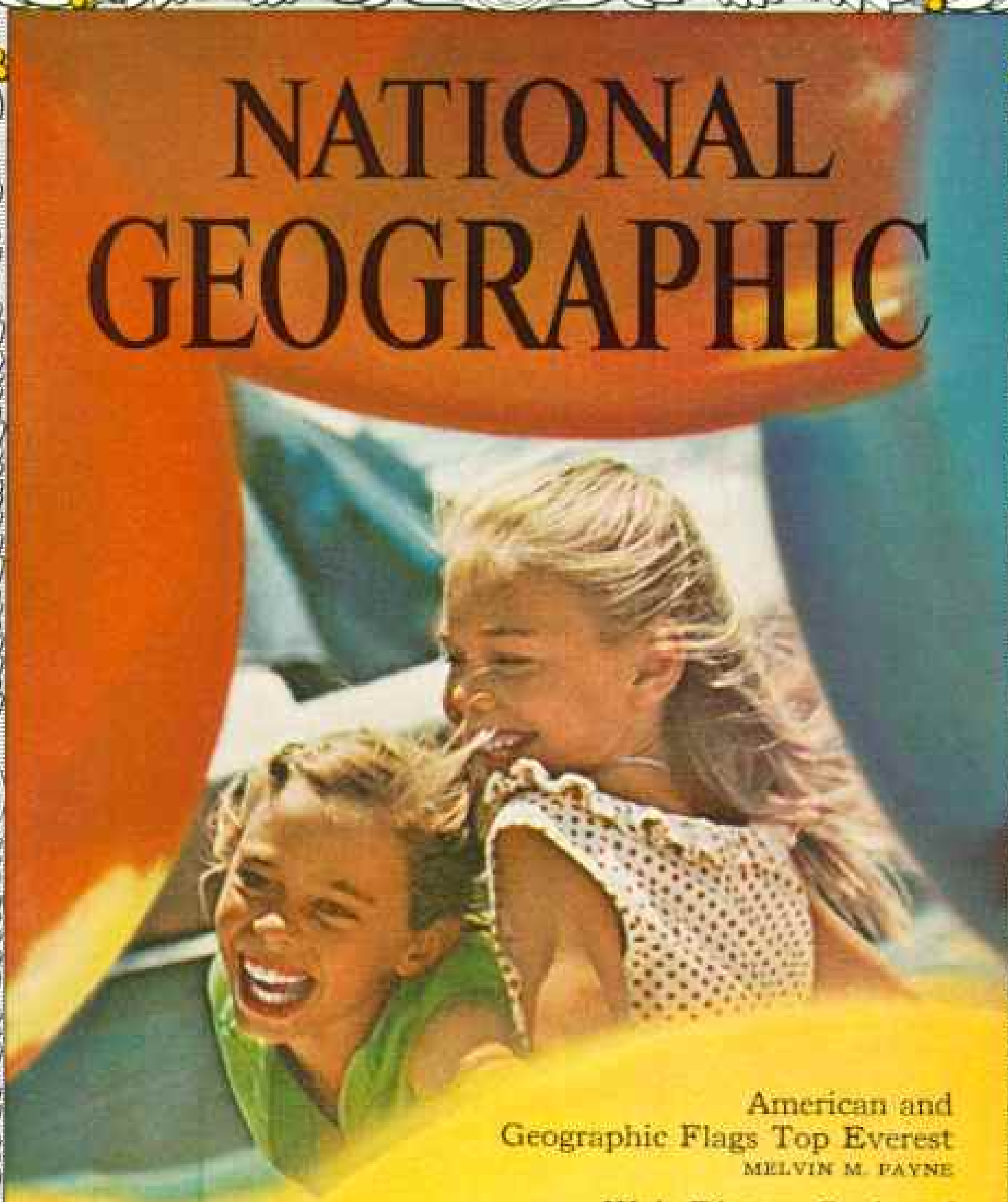
VOL. 124, NO. 2 AUGUST, 1963

NATIONAL GEOGRAPHIC



$8.00 A YEAR $1.00 A COPY

THE JOURNAL OF THE NATIONAL GEOGRAPHIC SOCIETY WASHINGTON, D. C.

NATIONAL GEOGRAPHIC SOCIETY

WASHINGTON, D. C.

75TH ANNIVERSARY

1888–1963

Organized "for the increase and diffusion of geographic knowledge"

The National Geographic Society is chartered in Washington, D. C., in accordance with the laws of the United States, as a nonprofit scientific and educational organization for increasing and diffusing geographic knowledge and promoting research and exploration.

Since 1890 the Society has supported more than 200 explorations and research projects, adding immeasurably to man's knowledge of earth, sea, and sky. It diffuses this knowledge through its journal, NATIONAL GEOGRAPHIC; more than 24 million maps distributed each year; its books, globes, and atlases; 30 School Bulletins a year in color; information services to press, radio, and television; and the publication of technical monographs.

Articles and photographs of travel, natural history, and expeditions to far places are desired. For material used, generous remuneration is made.

COVER: Framed by bright balloons, children reflect the gaiety of Walt Disney's magic kingdom (page 159).

NATIONAL GEOGRAPHIC MAGAZINE

The Special K Breakfast that fits so many modern diets

built around the low-fat, protein cereal that tastes good, too

THE SPECIAL K BREAKFAST

4 ounces of orange or tomato juice—or half a medium-size grapefruit

1 ounce (1½ cups) Special K with 1 teaspoon sugar

4 ounces skim milk

Black coffee or tea

(Only 240 calories)

The Nutrition Story of Kellogg's Special K

One serving of Special K (1½ cups with ½ cup skim milk) supplies 14% of the recommended daily protein allowance for an adult man, and approximately these percentages of his minimum daily requirements as established by the Food & Drug Administration:

Thiamine (B_1)	44%
Riboflavin (B_2)	60%
Niacin	51%
Vitamin C	38%
Vitamin D	50%
Calcium	22%
Phosphorus	22%
Iron	36%

The newer knowledge of food (and of food's effect on the body) is carefully reflected in the Special K Breakfast, built around a unique cereal food—Kellogg's Special K.

Those concerned about the amount and type of fat in their diets can enjoy it without a qualm. A serving of Special K (1½ cups) with 4 ounces of skim milk contains only 0.24 grams of fat.

Weight-conscious folks will appreciate the fact that the Special K Menu totals no more than 240 calories. Yet, it provides the complete high-quality protein (and other nutrients) needed in the early morning to get going.

And finally, the modern dieter knows that breakfast foods chosen must be appetizing. To the taste, to the eye, in the mouth.

Special K is, indeed, a delicious cereal. Crisp and light, enjoyable week after week, month after month.

Doesn't the Special K Breakfast fit into your diet—or someone's in your family?

"The best to you each morning"

Kellogg's

SPECIAL K

GO in spite of

Heat, Wear, Blowouts, Punctures: new Goodyear Double Eagle with LifeGuard Safety Spare

New Vytacord, only in new Double Eagle, gives added protection against heat, a tire's worst enemy. At today's high, hot turnpike speeds, tires made with Vytacord run cooler, are stronger than tires made with nylon or rayon.

New LifeGuard Safety Spare is a complete inner tire. Not just a shield or tube, but a fully-inflated tire with tread, cord and bead. Spare inner tire keeps going even if outer tire is damaged. 965 round safety cells ride over puncturing objects. (New Double Eagle still in short supply—place your order now.)

New—Widest tread made. With Tufsyn rubber. Wrap-around design. Outwears any other auto tire made. New radial whitewall pattern adds high-styling to your car.

GO GO

GOODYEAR

MORE PEOPLE RIDE ON GOODYEAR TIRES THAN ON ANY OTHER KIND

GEOGRAPHIC pictures re-create the past for Indian members

LIKE MANY FATHERS, Porfirio Montoya turns to his collection of NATIONAL GEOGRAPHICS to instruct his son.

Governor of the Santa Ana tribe of Pueblo Indians in New Mexico, Mr. Montoya here illustrates a point in Indian history with color photographs of Mesa Verde cliff houses in the December, 1961, issue.

Montoya's knowledge of Pueblo traditions has helped the National Park Service and the National Geographic Society in their preservation of Indian villages that cling to the cliffs of Mesa Verde National Park in Colorado. About 700 years ago, drought-stricken cliff dwellers abandoned their homes, and many migrated to New Mexico. Ancestors of the Montoyas presumably were among them.

Support for such projects comes from the modest dues of members. Why not share your enjoyment and, at the same time, help further your Society's aims. Nominate your friends for membership. The blank below can be their open sesame to adventure.

ROBERT W. MADDEN, NGS STAFF

Only surviving potter of the Santa Ana Pueblo Indians, Dora Montoya applies a rainbow design to a water jar. Husband Porfirio reads to son Floyd from a NATIONAL GEOGRAPHIC. Navajo rugs, obtained in trade, brighten their adobe home.

NATIONAL GEOGRAPHIC SOCIETY MEMBERSHIP CHECK ONE

Mail to: The Secretary
National Geographic Society
Washington 36, D. C.

$6.50 — CALENDAR YEAR 1963 MEMBERSHIP DUES INCLUDE SUBSCRIPTION TO THE NATIONAL GEOGRAPHIC.

Annual dues in the United States and throughout the world are $6.50. To compensate for international postage differentials, remit in U.S. funds or equivalent, $7.00 for Canadian membership; $8.00 for all other countries.

Life membership for the U.S., its outlying areas, and Canada is $150, elsewhere, $200. Remittances should be sent direct to the National Geographic Society in U.S. funds or equivalent. ★★★

NEW MEMBER'S NAME _____
(PLEASE PRINT NAME OF AN INDIVIDUAL ONLY)

STREET _____

CITY, ZONE, STATE _____

☐ **I NOMINATE** for Society membership the person named at left. (Use separate sheet for additional nominations.)

☐ **(GIFT MEMBERSHIP)** I nominate and enclose $_____ for dues of the person named at left. Send gift card ☐

☐ **I DESIRE INFORMATION** concerning membership and the NATIONAL GEOGRAPHIC. (Fill in at left.)

MY NAME _____
(PLEASE PRINT)

STREET _____

CITY, ZONE, STATE _____

TRAVEL QUIZ

Dogs are used for blankets in:

☐ *Iceland* ☐ *Thailand* ☐ *Australia*

On chilly nights, Australian aborigines put on a dog. A real cool night rates a five-dog "blanket." To cover yourself, in cold or hot climes, bring along First National Bank of Chicago Travelers Checks. They're safe—only you can cash them!

Panama hats are made in:

☐ *Ecuador* ☐ *Panama* ☐ *Cuba*

Head for Ecuador to buy homemade Panama hats. But before you grab your coat, pick up some First National Bank of Chicago Travelers Checks. Each denomination ($10, $20, $50, $100) is a different color to prevent errors in cashing.

Largest hailstones fell in:

☐ *Texas* ☐ *Nebraska* ☐ *Honolulu*

Hailstones, up to 17 inches in circumference, crashed to earth near Potter, Nebraska on July 6, 1928. Nebraska-bound or not, when you travel, carry First National Bank of Chicago Travelers Checks. They're acceptable anywhere. Ask for them at your bank.

Building with Chicago and the nation for 100 years

The First National Bank of Chicago

Travelers Checks

For All Business and Vacation Travel

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

You can get direct-mail processing by Kodak for your Kodachrome films

©EASTMAN KODAK COMPANY MCMLXI

1 Buy KODAK Prepaid Processing Mailers at your dealer's. Price covers the processing cost.

2 Mail your exposed film—still or movie—direct to Kodak in the handy envelope mailer provided.

3 Get your prints, slides or movies back directly by mail, postpaid.

Look for "Processed by Kodak" on your color slides or movies and "Made by Kodak" on the back of your color prints.

EASTMAN KODAK COMPANY
Rochester 4, N.Y.

One finger photography

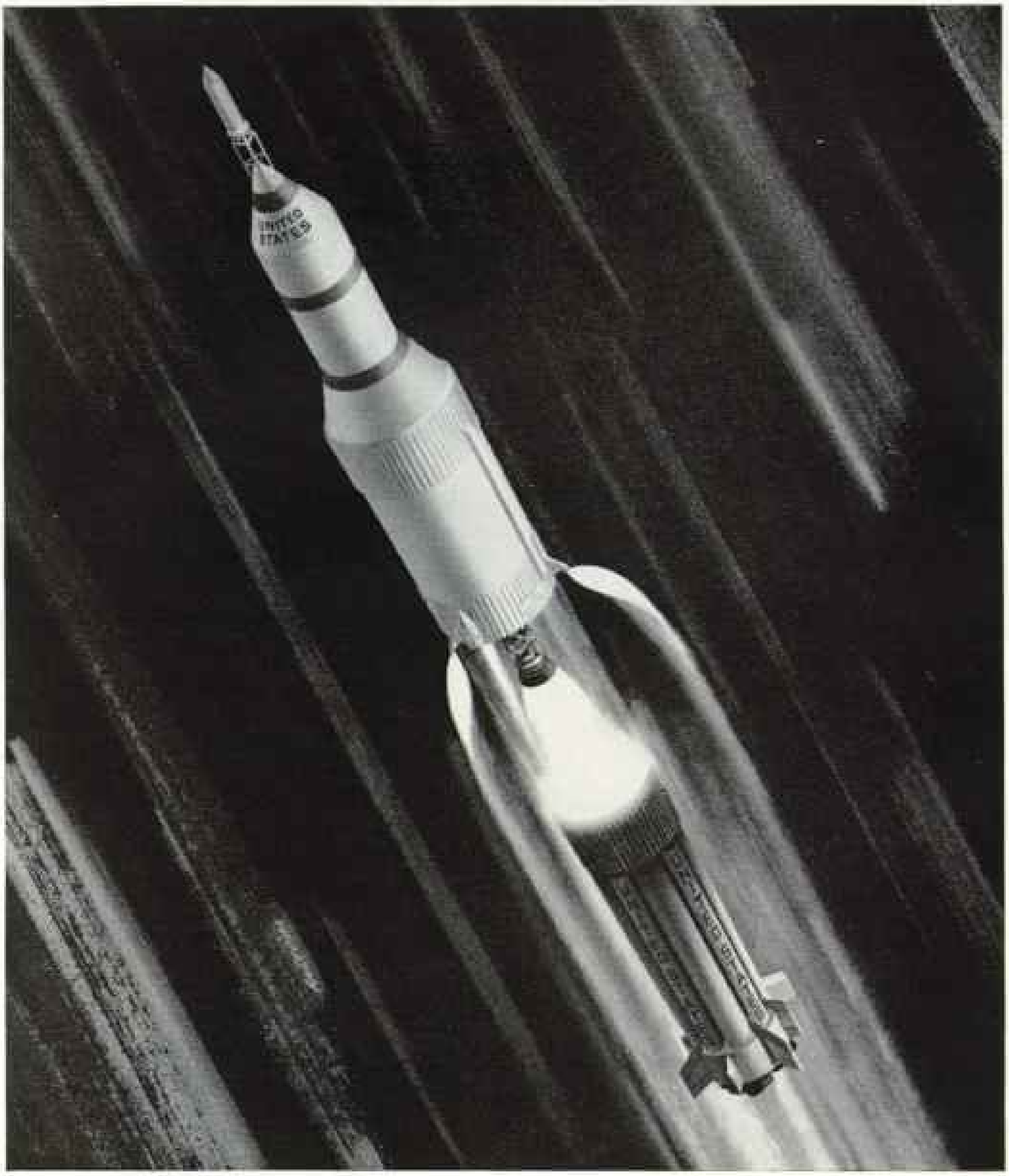
Now, at the touch of a finger, you take one picture, and instantly get set for the next! With the KODAK MOTORMATIC 35F Camera, a spring-powered motor winds the film automatically . . . lets you get up to ten shots in ten seconds! A built-in electric eye sets exposure. A handy pop-up flash holder is built right in—and flash exposure is set automatically as you focus. Try the KODAK MOTORMATIC 35F Camera at your Kodak dealer's. Less than $120.

EASTMAN KODAK COMPANY, Rochester 4, N.Y.

Price subject to change without notice.

Kodak
TRADEMARK

A key factor in the NASA Apollo program, the Saturn S-IVB, operating as the second and final stage of the Saturn IB, will place the Apollo spacecraft into earth orbit. It will also operate as the third and final stage of the Saturn V, which NASA (National Aeronautics and Space Administration) has assigned to sending a manned Apollo to the moon late in this decade. S-IVB is 58 feet tall and 22 feet in diameter.



SATURN S-IVB is built by DOUGLAS

Resist (if you can) the lure of COLORADO *in autumn*

Summer fun in full color—that's the allurement Colorado offers you in the Fall.

Plains, foothills, mountains, Western Slope—all Colorado is ablaze with beauty. Highways are uncrowded. Summer resorts are open. The weather is perfect—high, cloudless skies, tangy days, cool nights.

Everywhere is camera country!

In golden waves the sunlit plains roll to the horizons. From the draws the coronets of gnarled old cottonwoods are silhouetted against the sky. The big land lifts gently westward to meet the foothills. Frosts that had lain like jeweled cobwebs over the hollows now spread boldly upon the hills. There's the golden foam of rabbitbrush alongside the highways, and the leaves are a-bloom. Sumac, wildrose, raspberry, scrub maple, thimbleberry—frosty nights and brilliant autumn sunshine have distilled in the leaves pure tones of scarlet, carmine, crimson, maroon.

Miniature forests of scrub oak clothe the slopes in a symphony of yellows, russets and browns. The silhouette of the Continental Divide is a bride's blue, the higher peaks touched with early snow.

As the foothills climb toward the majestic Rockies, the boulder-leaping streams are overhung with the bright yellows of alders, willows and narrow-leaf cottonwoods. A distant slope is splashed with gold. Soon the aspens are everywhere—saffron, lemon, chrome yellow, crimson—spilling down the gulches in golden torrents, marching up mountainsides through solid walls of black-green spruce, islands of gold afloat in a meadow. Highways become tunnels through living gold mines.

This is September in the high country.

When the curtain finally falls on the aspen spectacular, in October, it is Indian Summer. Now the canyons are rivers of deep purple, and the eternal solitude of the mountains is hung with gossamer veils of lilac, amethyst and lavender. Deep peace lies over the land.

Come . . . gather a bouquet of colorful memories to carry for your lifetime. Restore your vigor; *live* a while! *This Fall, for sure . . . Colorado!*

OF COURSE there's lots to do, as well as see, in Colorado. Visit folklore fiestas, Old West rodeos, cliff dwellings, quaint ghost mining camps. Swimming, golf, fishing, big game hunting. Lots of spots for night-life fun. Places to stay in every price range.

COLORADO DEPT. OF PUBLIC RELATIONS
332 State Capitol, Denver 2, Colorado

Please send:
- ☐ 32-page, full-color Vacation Guide
- ☐ Complete List of Statewide Events for Fall
- ☐ Full-color State Highway Map Folder
- ☐ Hotel, Motel, Resort, Dude Ranch information, prices

Name_____

Address_____

City_____ Zone____ State_____

You've heard about it!

The blade that lasts and lasts (for more shaves than you dreamed possible - each one a smoother, more comfortable shave)

Now it's here-

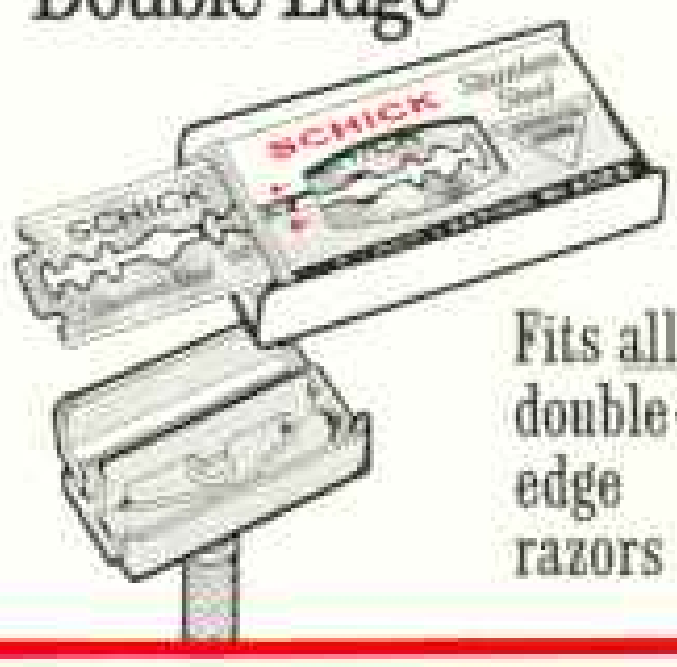
Schick

Stainless Steel

in your choice of TWO GREAT BLADES:

STAINLESS KRONA

Double Edge



Fits all double-edge razors

Injector

Fits all Injector razors

SCHICK SAFETY RAZOR CO., DIVISION OF EVERSHARP, INC.

Schick Quality Around the World/Factories in Halmstad, Sweden; Toronto, Canada; and Milford, Conn.

Jim Girod is an Assistant General Superintendent of Mines in Uniontown, Pennsylvania

"With my company benefits...who needs life insurance?"

"But a MONY man showed me I did . . . especially after the twins came."

Jim Girod talks with Ed Sitler, CLU

"I thought I was in great shape . . . what with my company benefits plus some insurance of my own.

"So I guess I didn't give MONY man Ed Sitler much encouragement.

"But Ed made sense. 'You'll be sitting pretty when you retire,' he said. 'But with the twins, you've got 5 youngsters to protect. Will your wife have enough income if you suddenly died?'

"Ed designed a plan around what my company was doing, to give her the right protection.

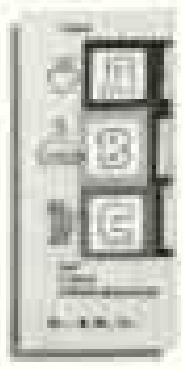
"He also set up MONY Health Insurance around my company benefits . . . which kept the cost down! I've got real peace of mind . . . thanks to Ed, and MONY!"

MONY MEN CARE FOR PEOPLE. *They'll be glad to discuss both life and health insurance, and are well trained to work out a plan to help you. For more information about* MONY *insurance, mail coupon at right.*

MONY
MUTUAL OF NEW YORK

MONY
Dept. G 83
Broadway at 55th St.
New York 19, N. Y.

Please send me your free, easy-to-read booklet, "The ABC of Life Insurance."



NAME

ADDRESS

CITY ZONE

STATE

BIRTH DATE

OCCUPATION

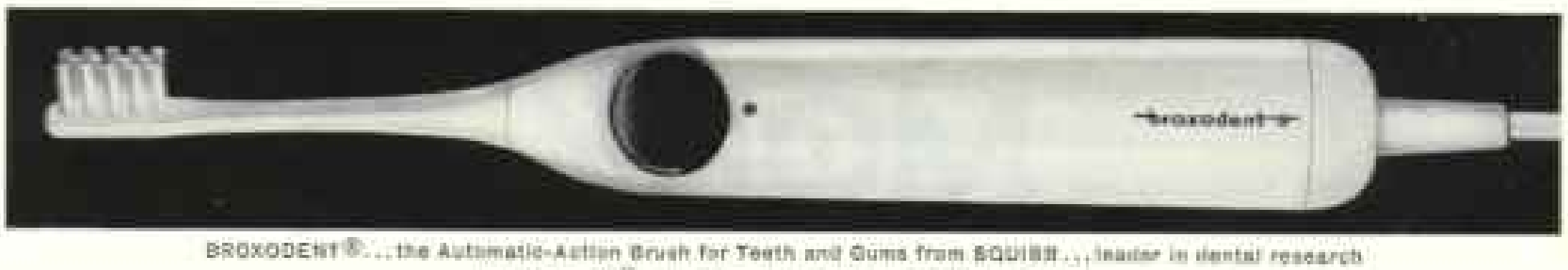
MONY HAS SERVED THE PUBLIC FOR 120 YEARS

Are you the overly-vigorous type of toothbrusher?

Do you brush your teeth as vigorously as if you were scrubbing the wheels of your car? No matter what type of toothbrusher you are, you'll brush your teeth *better* with BROXODENT, the automatic-action brush for teeth and gums from Squibb, leader in dental research. BROXODENT brushes *up-and-down*—120 times a second. Dislodges tiny food particles, refreshes gums, leaves mouth feeling tinglingly clean. Constant power—no batteries to run down. Convenient on-off switch. BROXODENT was tested 4 years in dental clinics. Ask your dentist about BROXODENT. With four different colored snap-on brushes. Extra brushes available. At your druggist's.

Whatever your type, you'll brush your teeth better with Broxodent

Broxodent® from SQUIBB



BROXODENT®...the Automatic-Action Brush for Teeth and Gums from SQUIBB..., leader in dental research
BROXODENT® is a trademark • SQUIBB DIVISION Olin

UNITED OFFERS THE MOST JETS TO LOS ANGELES, BUT WHERE IS THE HELICOPTER TO DISNEYLAND?

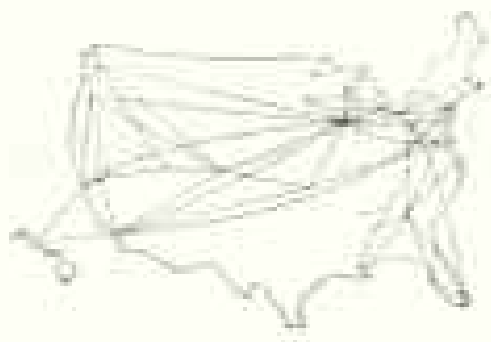
At first glance, you'd think only United jets land at our new Los Angeles jet terminal.

Not so. Helicopters land there, too. In fact, you can step from a United jet, walk a few steps, and board a convenient helicopter to Disneyland or 17 other points. The area at right (near the red truck) is the only airport boarding area for Los Angeles Airways helicopters. What could be more convenient?

Also for your convenience in planning a trip here, keep in mind that United offers more jet service to Los Angeles, from more U. S. cities, than any other airline. For instance, five nonstops from New York, seven from Chicago.

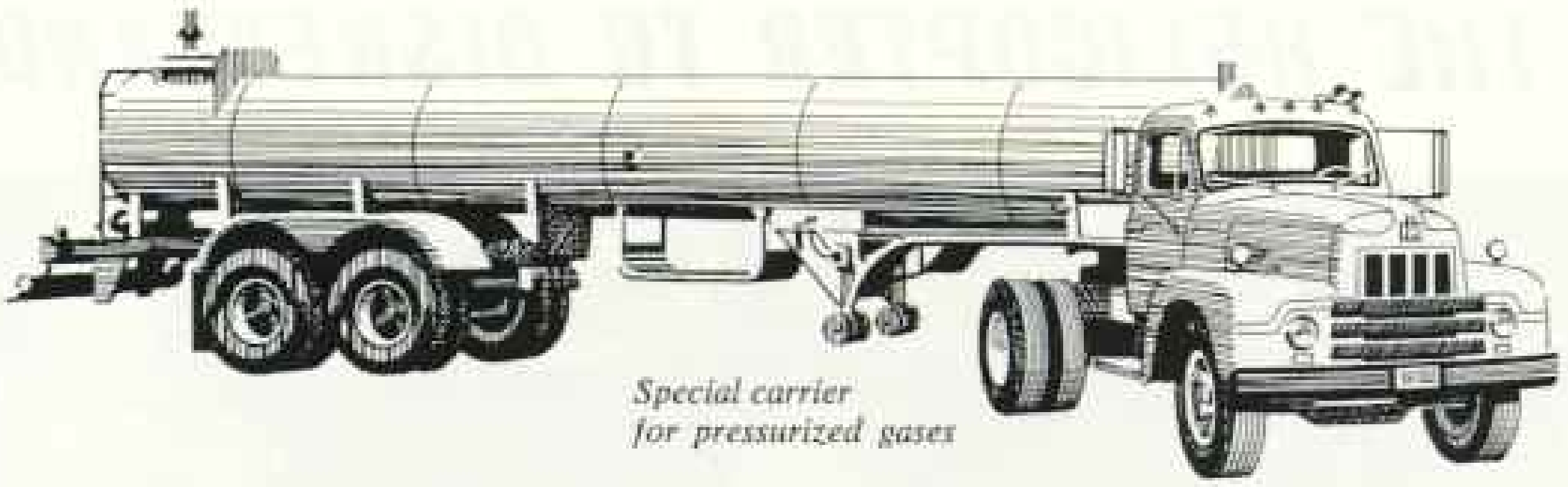
Most important, you'll appreciate the genuine concern we have for you as an individual. Extra care—for people—is the best basis we know for running, or choosing, an airline.

Make your reservations today for jet, helicopter or convenient rental car. Just call United or your Travel Agent.



UNITED

THE EXTRA CARE AIRLINE



Special carrier
for pressurized gases

Hopper truck,
dumps load through bottom

KNOW YOUR TRUCKS!

If you think a truck is a truck—take another look next time you're on the highway! There are hardly any two alike. Nearly every good-sized truck you see today is a specially-built job—carefully designed to carry its particular load with greatest speed and safety at lowest cost. The result is a lower delivered cost on *nearly every product or service you buy*. Just try to imagine, for a moment, what *your* life would be like if all of America's more than 12 million trucks stopped running tomorrow!

MEMBER
ATA FOUNDATION INC
AMERICAN TRUCKING INDUSTRY
Washington 6, D.C.

INTERNATIONAL HARVESTER COMPANY

World's largest maker of heavy-duty trucks

INA makes your Everydayland as carefree as Disneyland

A friendly engineer and two bright red wheels beguile little eyes. Wouldn't it be nice if we could all live in Disneyland?

But you and your family (and all of us) live in problem-filled Everydayland. Happily, Insurance Company of North America lives there too. That's one reason why INA invented Homeowners Package insurance back in 1950 —to protect you against fire, theft, burglary, personal liability and just about anything that might happen in and around your house. Because this important coverage comes in one efficient policy, INA's Homeowners Package can save you up to 20% on premiums too. Remember, INA has been protecting families since 1792 and, today, INA stands behind you with more than $1 1/3 billion in assets.

When you visit Disneyland (which INA insures, incidentally), be sure to stop by the INA Information Center at Carefree Corner and say hello to Donna Rochelle. Ask about the free INA Insurance Estimator to help you estimate the amount of insurance you need on your house. Or why not mail our coupon?

Mrs. Donna Rochelle
Carefree Corner, Disneyland
1313 Harbor Blvd., Anaheim, California

Dear Donna:
Please send me the free INA Insurance Estimator.

Name _____

Address _____

City _____ Zone ____ State _____

☐ I would like an INA agent to call

INA

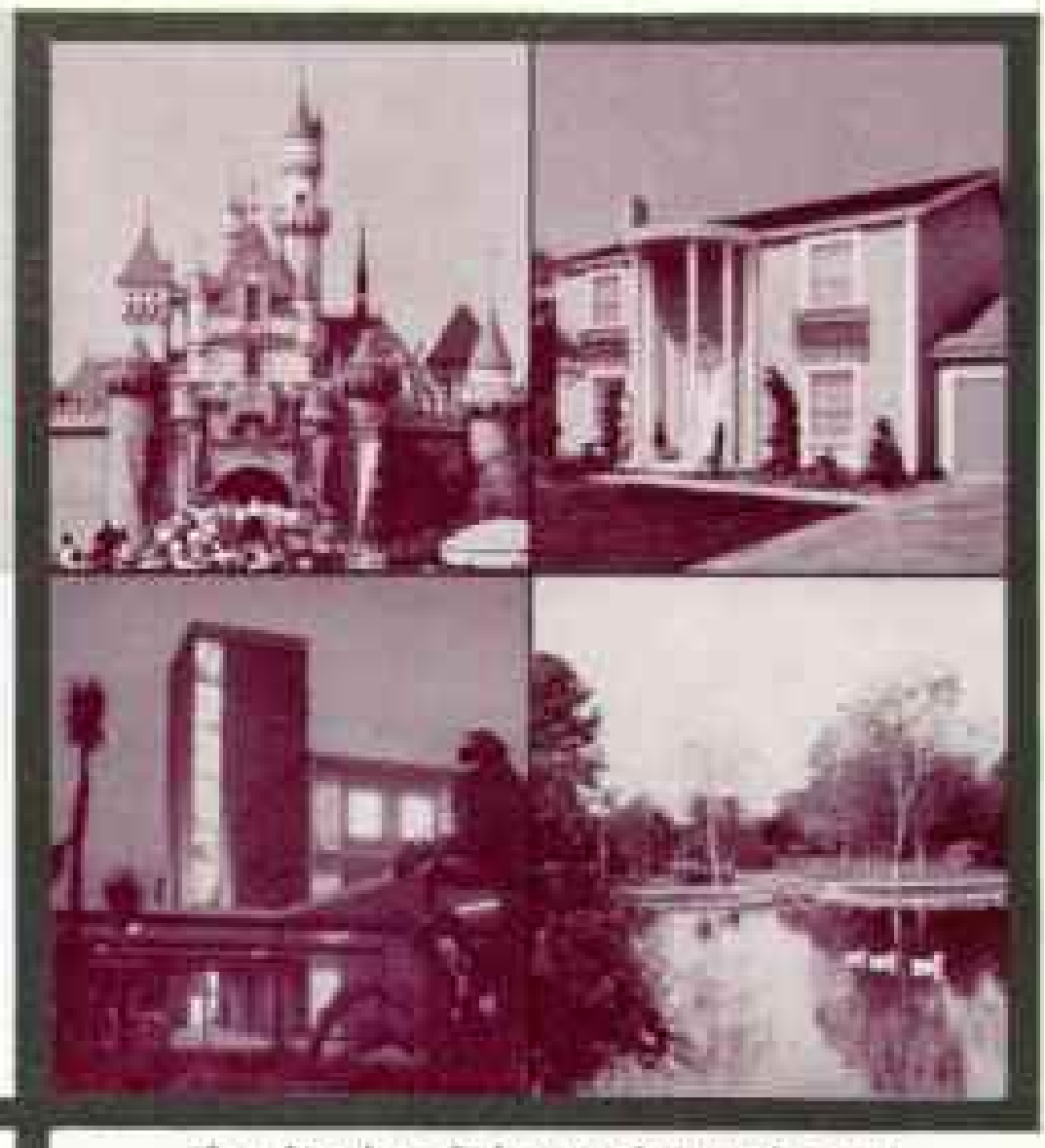
INSURANCE COMPANY OF NORTH AMERICA

World Headquarters: Philadelphia

PLAY and LIVE in . . .

ANAHEIM

home of Disneyland



THE IDEAL CENTRAL HEADQUARTERS FOR YOUR CALIFORNIA VACATION.

The ideal year-round community in which to live, work and prosper.

- HOTEL, MOTEL ACCOMMODATIONS FOR THOUSANDS.
- COMPLETE CONVENTION FACILITIES.
- LARGE INDUSTRIAL COMMUNITY.
- BEAUTIFUL, SPACIOUS RESIDENTIAL AREAS.
- OUTSTANDING SCHOOLS, PARKS & RECREATION AREAS.

for further information write to:

ANAHEIM CHAMBER OF COMMERCE
122 North Lemon St. (Dept. 63)
Anaheim, California
or
ANAHEIM AREA VISITORS & CONV. BUREAU
930 West Katella Ave. (Dept. 64)
Anaheim, California

This IS Southern California

Minutes away from the top pleasures of Southern California—in a private, wonderful world of your own!

- Monorail to Disneyland
- 450 airconditioned rooms
- Lighted Golf Center
- New Tower Suites July 1st
- 23,000 square feet Convention Space

Ask your Travel Agent or write Anaheim, California.

Disneyland Hotel

TERRIFIC STAMP BARGAIN!

Israel—Iceland—San Marino—plus triangle set—Plus Antigua—Barbuda—Virgin—Scouts—Congo—Russia—Plus large stamp book—all four offers free—Approvals included—Send 10c for mailing cost.

EMPIRE STAMP CORP.

Dept. NS, • Toronto, Canada

DON'T CLIMB STAIRS
RELAX . . . RIDE A
SEDGWICK "STAIR-CHAIR"

Put an end to climbing stairs. Ride safely, effortlessly from floor to floor on a Sedgwick Stair-Chair® Quickly, easily installed, electrically operated. Costs about $1400 (installed N.Y.C.) Nationwide service

Sedgwick
MACHINE WORKS
259 West 14th Street, New York 11
Other Sedgwick Products
Residence Elevators • Dumb Waiters
Sidewalk Elevators • Freight Waiters
Established 1852

Do you know how to restore the breath of life?

When breathing stops, a simple procedure called mouth-to-mouth rescue breathing often restores the breath of life.

Metropolitan Life suggests that you post this page in your home where you will always have it ready for quick reference.

Before attempting rescue breathing, lay victim on back. Turn head to the side. Wipe any foreign matter out of the mouth with your fingers. Then straighten victim's head.

1 Place one hand under victim's neck and lift. Tilt head back as far as possible by holding the crown of the head with your other hand.

2 Pull chin upward until the head is tilted back fully. This is essential for keeping the air passage open.

3 Place your mouth tightly over victim's mouth. Pinch nostrils shut. Breathe hard enough to make the chest rise. For babies and very young children, cover *both* nose and mouth tightly with your mouth.

4 Remove mouth. Listen for sound of returning air. If you don't hear it, recheck head position. Breathe again. If you still get no air exchange, turn victim on side and slap between shoulders to dislodge foreign matter. Repeat breathing, removing mouth each time for escape of air.

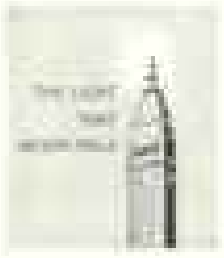
For an adult, breathe vigorously about 12 times a minute. For a small child, take relatively short breaths, about 20 per minute.

Don't give up until the victim begins to breathe himself. Call a doctor or ambulance promptly. Keep the victim warm and quiet.

Metropolitan's First Aid Chart tells what to do in many other common emergencies.

For a free copy, mail the coupon below or call your local Metropolitan office.

Metropolitan Life
INSURANCE COMPANY



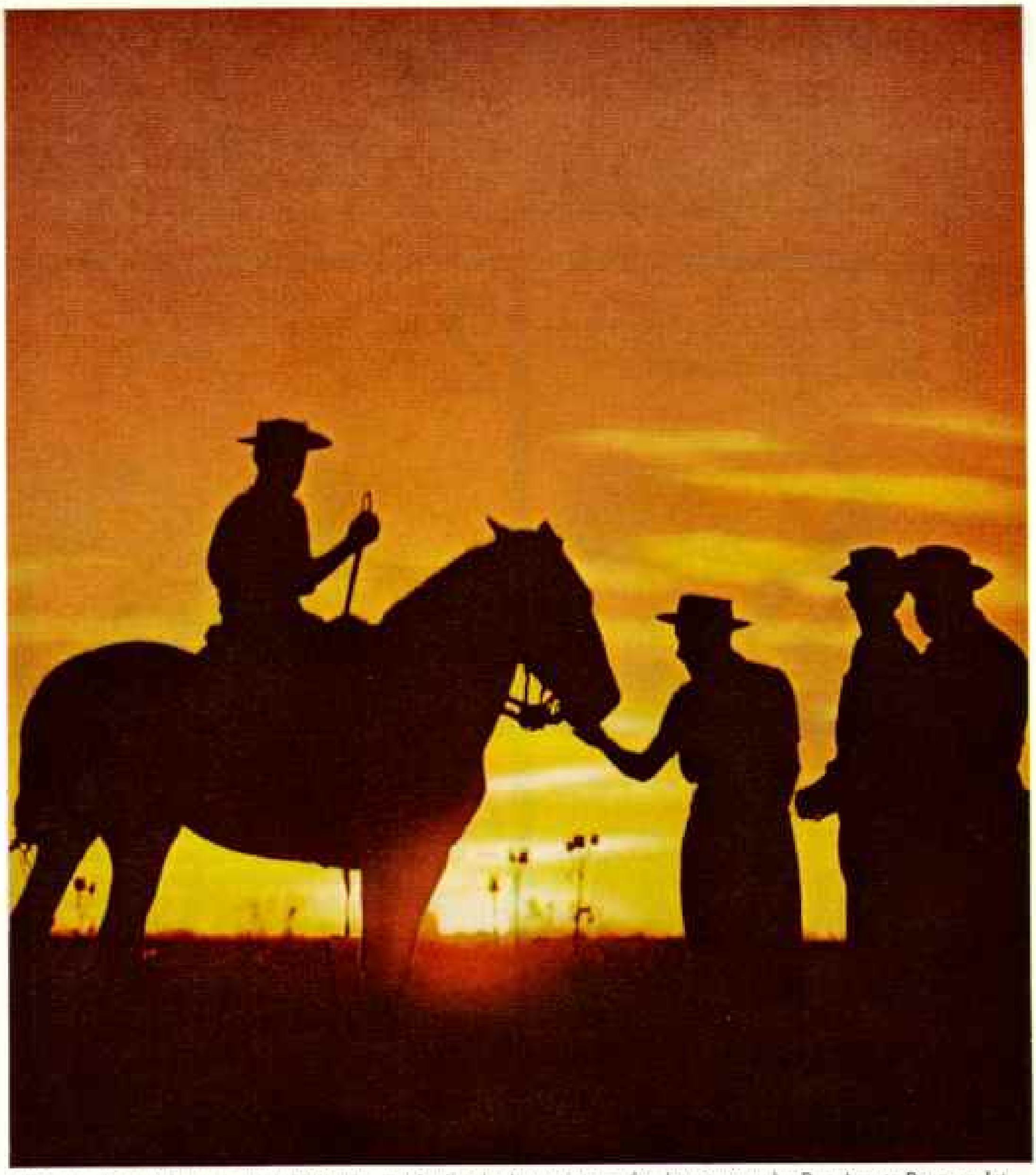
Metropolitan Life (Dept. N-83),
1 Madison Avenue, New York 10, N.Y.
Please send me the free "First Aid Chart."

Name (PLEASE PRINT)

Street

City & Zone State

FIRST AID



The gaucho isn't just a legend. He's very much alive in Argentina—a few hours away by Pan Am or Panagra Jet.

South America: where nights are NIGHTS!

In the nighttime world of Argentina, gauchos still gather on the pampas to barbecue a cut of fresh beef. And only 60 miles away, Buenos Aires turns its lights on and becomes the Paris of the Western Hemisphere. Restaurants with giant steaks at snack prices. Theatre, opera, exciting night clubs—this is Buenos Aires, just one of many great South American cities. The only way to see South America is to see them all! *And the only airline system that can fly you completely 'round the continent is Pan Am • Panagra.* See Rio, Lima and many other cities on a round trip Jet ticket to Buenos Aires. Pay as little as $630, Jet economy fare from New York. Reservations? See your Pan Am Travel Agent or call Pan Am.

PAN AM • PANAGRA

PAN AMERICAN AIRWAYS — PAN AMERICAN-GRACE AIRWAYS

See both coasts for the price of one! Go one way, return the other with Pan Am-Panagra!

August
1963

NATIONAL
GEOGRAPHIC

THE NATIONAL GEOGRAPHIC MAGAZINE VOL. 124, NO. 2

American and Geographic Flags Top Everest

By MELVIN M. PAYNE, D.Sc.
Executive Vice President and Secretary
National Geographic Society

Illustrations by BARRY C. BISHOP
National Geographic Staff

Everest's forbidding West Ridge, never before conquered, looms above a scouting party. The National Geographic Society was major sponsor of the U. S. expedition that sent three two-man teams to the summit—one up this fearsome, gale-swept route. For the first time, four men reached the top in a single day—May 22.


EMPORIUM
TOYS
SOUVENIRS

EDACHROME © NATIONAL GEOGRAPHIC SOCIETY

The Magic Worlds of Walt Disney

By ROBERT DE ROOS

Illustrations by National Geographic photographer THOMAS NEBBIA

ONE AUTUMN EVENING in 1928, a new actor appeared at the Colony Theatre in New York in a movie called *Steamboat Willie*, the first cartoon ever produced with sound.

He had ears bigger than Clark Gable's, legs like rubber hose, a grin wider than Joe E. Brown's, and a heart of gold. His name was Mickey Mouse.

Beginning that night, Mickey and his creator, Walt Disney, grabbed the world's funny bone and have never lost their grip.

The New York *Times* praised the new film as "ingenious."

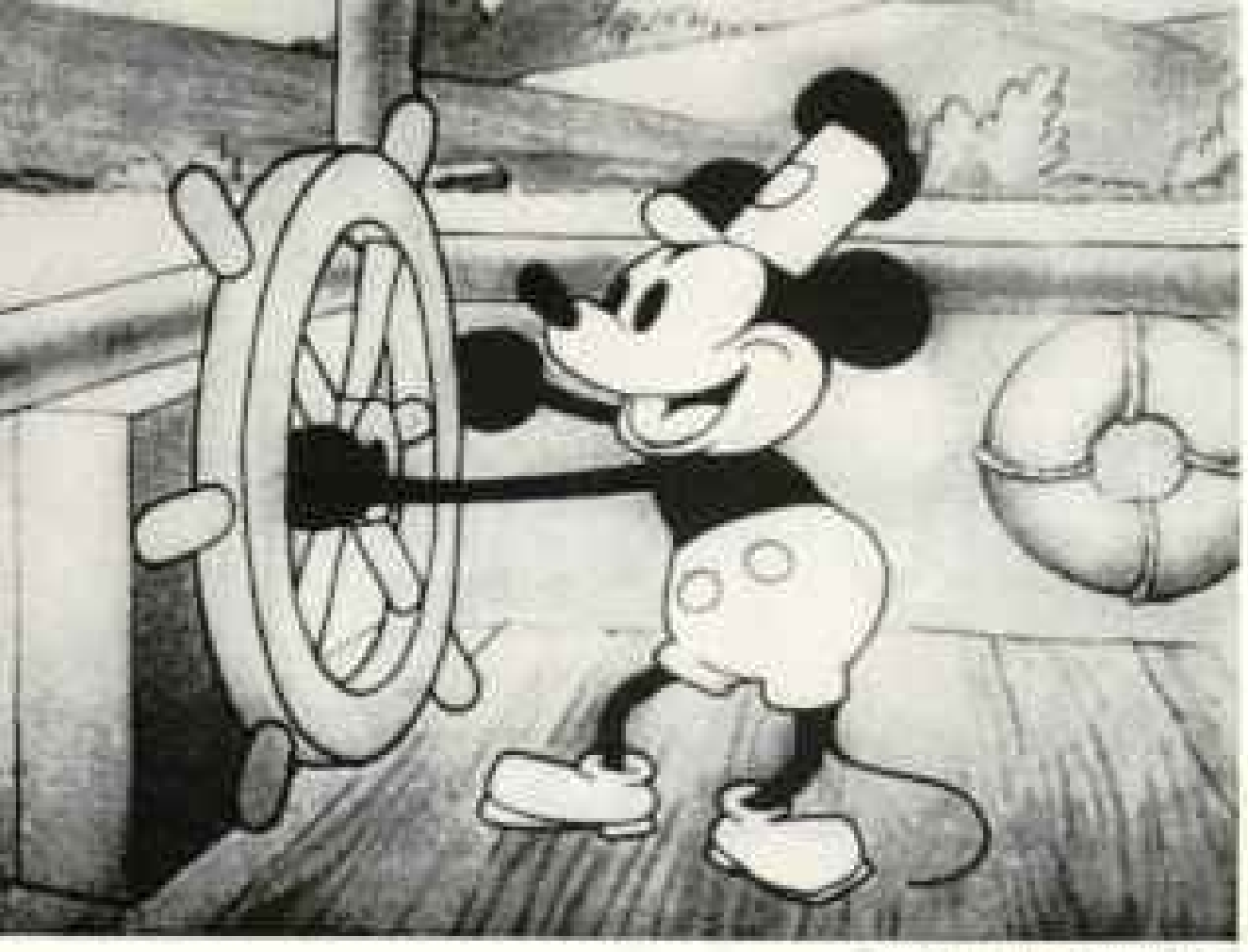
"A wow!" cried the *Weekly Film Review*.

Thus was born history's most influential mouse. Mickey led the way in the development of animation as a new art, to the exploration of the world of animals and faraway people and of their adventures and geography.

Mickey Mouse has skipped from triumph to triumph—always preceded by three words in big letters: "WALT DISNEY PRESENTS."

Mickey is featured in comic strips and books in 15 languages, became the star of television's Mickey Mouse Club, and, finally, founded a magic kingdom called Disneyland.

Host Walt Disney halts his old-fashioned fire truck on Disneyland's Main Street and gives autographs. Each year his magic kingdom near Anaheim, California, draws five million visitors.

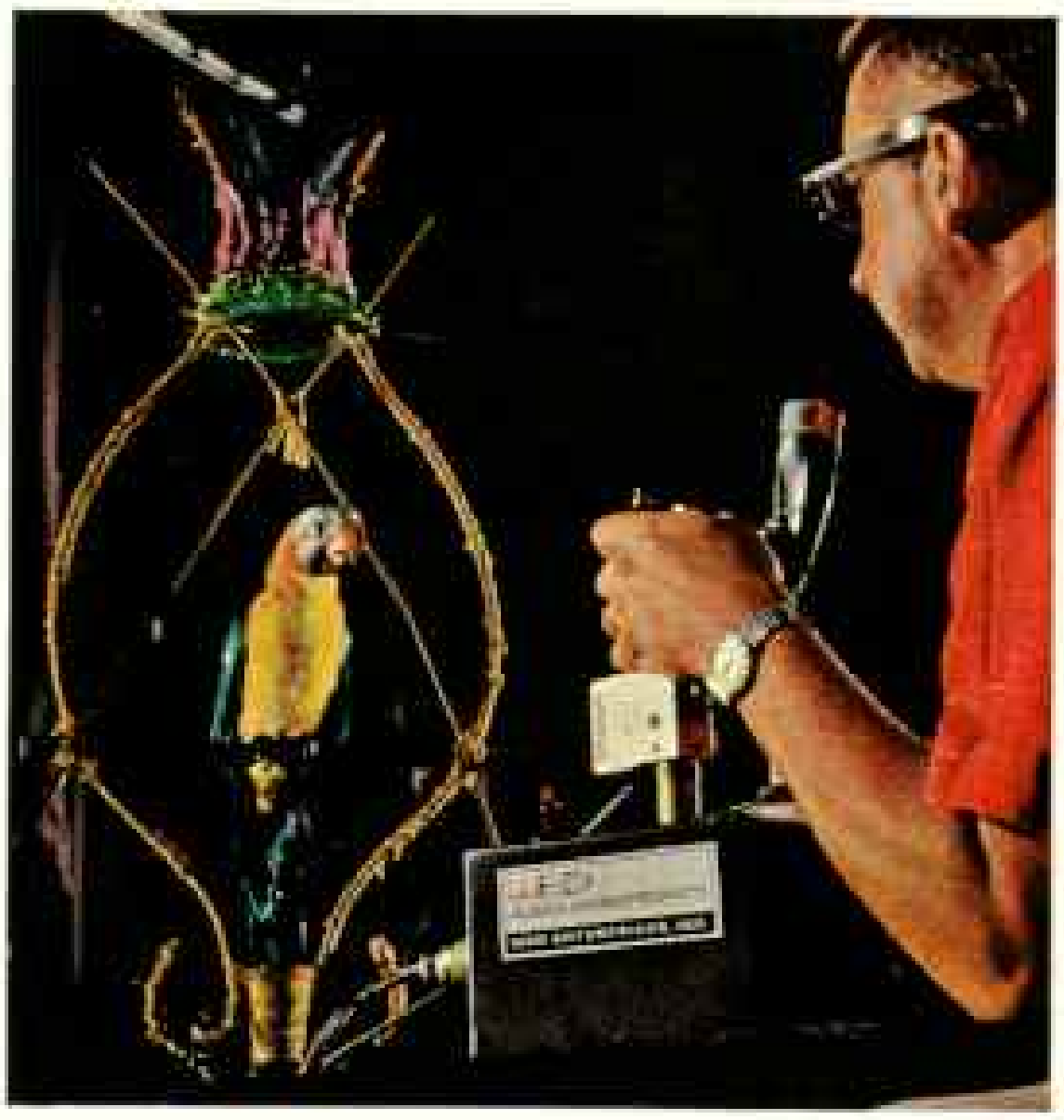


© WALT DISNEY PRODUCTIONS

Mickey Mouse as Steamboat Willie Launches Two Fabulous Careers

First sound cartoon ever released, the Walt Disney short opened in New York in 1928. An international celebrity almost overnight, the wonder mouse led his creator to the pinnacle of show business. For years, the high-pitched, boyishly breathless voice emerging from the sound track was Disney's own, and of all his cartoon characters, Mickey remains closest to Disney's heart.

REPHOTOGRAPHED BY NATIONAL GEOGRAPHIC PHOTOGRAPHER THOMAS NEBBIA © N.G.S.



Elephants really fly in Disneyland, a 20-year dream come true for its builder. Young at heart of all ages soar happily aboard Dumbo, a ride in Fantasyland.

Mechanical marvel, a macaw in Disneyland's Enchanted Tiki Room, talks, sings, cocks its head, and puffs out its chest. Xavier Atencio activates the bird with magnetic tape—a feature of the new technique of Audio-Animatronics devised by Disney's "imagineers" (pages 204-7).

Bathed by klieg lights, Hayley Mills goes before the cameras in *Summer Magic*, the fourth film the British actress has made for Walt Disney Productions. At 17 she receives thousands of fan letters weekly and has been called the world's best-known teen-ager.

Kangaroo rat's valiant battle with a rattlesnake enthralls viewers of Disney's first feature-length True-Life Adventure, *The Living Desert*. Leaping and dancing, the rat kicks up a small cloud of sand, driving the serpent away. The episode illustrates Disney's technique of capturing intimate moments in the lives of animals.

He is Topolino in Italy, Mik-kii Ma-u-su in Japan, Ratón Mickey in Mexico, Micky Maus in Germany, Mikki Hiiri in Finland, and just plain Mickey in scores of other lands. He is known around the world—always with approbation and love.

Mickey, a versatile fellow, has been everything from farmer and magician to great lover and fire chief. He has directed planets and comets in their courses. He has defied time, space, and gravity. But, though bound to win, he has always fought the clean fight.

True to character, "Mickey Mouse" was the designation in World War II for diagrams of convoy movements toward Normandy's D-Day beaches, and Mickey rode into battles as the insigne on hundreds of ships and planes.

When King Bhumiphol of Thailand presented Walt Disney with a medal, he said quietly for Walt's ear alone: "This is an honor from my government, but more than that, it comes from me. I grew up on your cartoons."

Franklin Roosevelt demanded Mickey in the White House. Dowager Queen Mary of Britain liked to find Mickey on the bill whenever she went to the movies.

It can be said that Walter Elias Disney, the man, and Mickey, the mouse, have made a lasting impact on mankind.

700 Awards From Around the World

Last fall, in Walt Disney's outer office at the studio in Burbank, California, I got a glimpse into the dimensions of this durable pair, 35 years after the mouse clicked in the fertile Disney mind.

In cases ranged along the walls, on shelves and tables are some of the more than 700 awards the Disney organization has received (page 167). There are dozens of medals, citations, and plaques from appreciative governments attesting the international amity created by Disney's make-believe characters —Mickey, Donald, Goofy the dog, and all the others.

Walt once sent a proud director home with a newly won Oscar. "How did the family like it?" he asked next day.

"The kids weighed it first thing," the director said. "You might like to know an Oscar weighs 6 pounds, 12 ounces on our bathroom scale."

The Author: Free-lance writer Robert de Roos has contributed two previous articles to the GEOGRAPHIC—"Los Angeles" (October, 1962) and "Booming Arizona" (March, 1963). He is a former newspaperman and the author of four books.

The awards from the film industry mean most to Walt. But he is proud that conservation groups have also recognized his interest in protecting wildlife. He is proudest, perhaps, of the Audubon Society Medal awarded in 1955.

Walt's office has become so crowded that recently four cabinets of awards were placed in the studio commissary. Some of the employees promptly nicknamed the commissary "the awards room."

Disney Films Used in Teaching

Although Walt constantly denies he is an educator, his nature films, which he calls True-Life Adventures, have received accolades from educators. Films like *Seal Island*, *In Beaver Valley*, and *The Living Desert* were pioneering achievements. Walt's early edict for them and all the True-Life Adventure pictures was to get the complete natural history of the animals with no sign of humans: no fences, car tracks, buildings, or telephone poles. This concept, plus the intimacy, the extreme close-up view of the animal, completely won the public.

The True-Life Adventures; films of the nomadic Blue Men of Morocco, Japanese fishermen, Siam, the Alaskan Eskimo, and Switzerland; Donald Duck's adventures in Mathmagic Land; the man-in-space series, with technical advice by Wernher von Braun; Disney safety films, and many others are a solid part of the curriculum for thousands of school children, not only in the U. S. but abroad—including countries under Communist control.

I first saw Walt Disney sitting at a low coffee table, wearing his usual working garb: a short-sleeved sport shirt with a woolen tie, slacks, and a sleeveless alpaca sweater.

An aerial photograph of Disneyland dominated one wall. There were photographs of his family, including his five grandchildren; the Disney coat of arms; his first Academy Award.

"That first Oscar was a special award for the creation of Mickey Mouse," he said. "The other Academy Awards belong to our group, a tribute to our combined effort. The whole thing here is the organization. And the big problem was putting the organization together.

"Look at Disneyland," he went on, waving toward the aerial photograph. "That was started because we had the talent to start it, the talents of the organization."

"What's your role?" I asked.

"You know, I was stumped one day when a little boy asked, 'Do you draw Mickey Mouse?' I had to admit I do not draw any more. 'Then you think up all the jokes and ideas?' 'No,' I said, 'I don't do that.' Finally, he looked at me and said, 'Mr. Disney, just what do you do?'

" 'Well,' I said, 'sometimes I think of myself as a little bee. I go from one area of the studio to another and gather pollen and sort of stimulate everybody.' I guess that's the job I do. I certainly don't consider myself a businessman, and I never did believe I was worth anything as an artist."

Until a few years ago, Walt was president of the company, Walt Disney Productions. He resigned and was made board chairman. His older brother Roy became president. Then Walt, tired of signing things, resigned as chairman too.

Walt laughed at the memory. "Now my only title is executive producer. I'm the boss of everything that's produced here. I work on story ideas and gags; I work on every script, writing dialogue and planning scenes. When the story is set, I turn it over to the boys, and they make it.

"We film 25 new stories for television and six feature-length pictures a year—and, of course, we think up ideas for the park, Disneyland. The corporation gets its vitality from what we create."

The corporation exhibits considerable vitality: In 1962 this magic world showed a gross income of $74,059,000—more than $20,000,000 from Disneyland alone—and a net of $5,263,000.

The Secret Life of Mickey Mouse

All this vitality stems from a mouse that was conceived in desperation, gestated in secrecy, and almost died at birth.

In the fall of 1927, Walt Disney returned to Hollywood from New York without a staff and without a star. He had gone east to negotiate a new contract for his series Oswald the Rabbit. His distributor refused to meet his price and threatened to lure his whole organization away.

"I've already signed all your animators," the distributor told Walt.

Walt and Lillian Disney, his bride of two years, had a doleful trip across the continent. Walt needed a whole staff of animators. He also needed a new character—fast.

The idea for Mickey Mouse was born on

Too young to enlist in the Armed Forces in World War I, 16-year-old Walt Disney volunteered as a Red Cross ambulance driver. He arrived in France shortly after the Armistice and drove everything from this cut-down ambulance to five-ton trucks. His salary: $40 a month. But he made extra money by painting the Croix de Guerre on soldiers' leather jackets at 10 francs each. Drawing on the ambulance canvas is Disney's work.

1923: Young Cameraman Shoots Footage in a Hollywood Backyard

From Kansas City, Missouri, Disney followed his artistic star to California. His equipment: boundless ambition hitched to a fantastic imagination. With his brother Roy he started making animated cartoons in a dingy office. Experience gained from the first shorts—Alice in Cartoonland and Oswald the Rabbit—gave birth to Mickey Mouse. Here he tests an early movie camera, a Pathé model.

© WALT DISNEY PRODUCTIONS

Story session of the 1930's runs late into the night as Disney (center) and his staff plan a Silly Symphony cartoon. Rough drawings, tacked to the board, outline the basic plot. Pinto Colvig, pointing with pencil, originated the voices of Goofy, the affable dog, and two of the dwarfs, Grumpy and Sleepy, in *Snow White* (opposite).

the train. "I've got it," Walt told Lilly. "I'll do a series about a mouse. I'm going to call him Mortimer Mouse."

Lilly Disney frowned. "I like the idea, but Mortimer sounds too dignified for a mouse."

Walt thought a few minutes. "All right, we'll call him Mickey Mouse. Mickey has a good, friendly sound."

In Hollywood, Walt and Roy Disney and chief animator Ub Iwerks, now director of technical research, began work on Mickey. The defecting animators were still at the studio finishing the Oswald contract, and Walt did not want them to know he was starting a new series. So Ub Iwerks was sequestered in a locked office, and there in four hectic weeks, he animated an entire Mickey Mouse cartoon.

That first Mickey was entitled *Plane Crazy*, a bit of nonsense inspired by the Lindbergh flight. To get the drawings inked and painted on celluloid for the camera, Walt set up tables in his garage at home. There, Lillian Disney, her sister, and Roy's wife Edna did the job. A cameraman returned to the studio at night to put the pictures on film.

When Walt took the movie to New York, distributors were not interested. They were also not interested in a second Mickey, produced while Walt was traveling.

Mickey Saved by Plinks and Toots

Mickey was close to death. But he was literally saved by the bell—bells, whistles, plinks, and toots. Sound had made its first real impact on motion pictures with the release of *The Jazz Singer* in the fall of 1927. Walt decided to try it.

He and Iwerks rigged a homemade radio with a microphone. They put up a white sheet as a screen and, with two helpers, stood at the mike behind it with noisemakers, a mouth organ, and a xylophone. For six hours, Roy projected a short bit of animation from *Steamboat Willie*, the third Mickey film. The sound

Princess Holds Court in a Forest Glen: ***Snow White and the Seven Dwarfs***

Audiences throughout the world are still charmed by this idyllic tale of a fair young princess threatened by a cruel queen and befriended by lovable dwarfs. The 1938 film, Disney's first feature-length cartoon, has been reissued three times in the United States alone. Two of its nine songs, "Heigh Ho" and "Just Whistle While You Work," now rank as perennial favorites of popular American music. 165

makers watched the image and whanged away. It was ragged, but it convinced them that sound was for cartoons.

Walt hurried to New York with the film, and there *Steamboat Willie* was completed with sound. And it was ingenious and funny sound which transcended the mere novelty of actors singing or mouthing lines.

Sound was added to the first two Mickeys. Suddenly and dramatically, everybody wanted the talking mouse.

Walt and the mouse have come a long way since. Nothing about Walt Disney's background easily explains his success, though he began to draw at an early age.

His father, Elias Disney, was a carpenter in Chicago when Walter Elias Disney was born there in December of 1901. When Walt was four, the family—there were three older brothers and a younger sister—moved to Marceline, Missouri. Walt still recalls the horsecar ride to the railroad station.

At Marceline, one of Walt's first chores was to herd the pigs on the family farm. The Disneys were forced to sell the farm, and in 1910 moved to Kansas City, Missouri. There

Child star Shirley Temple presents producer Walt Disney with a special award for *Snow White*—an Oscar and seven miniature Oscars—at ceremonies of the Academy of Motion Picture Arts and Sciences in 1939.

Accolades from around the world surround Disney. His collection of more than 700 includes 28 Oscars, 5 Emmys from the National Academy of Television Arts and Sciences, and the Irving Thalberg Memorial Award of 1942 for "the most consistent high quality of production achievement." Cut-glass-and-silver pitcher is a tribute from the First Soviet Cinema Festival in 1935.

Walt's father bought a paper route with 800 customers. Roy and Walt were delivery boys. They started work at 4:30 in the morning and made their rounds on foot.

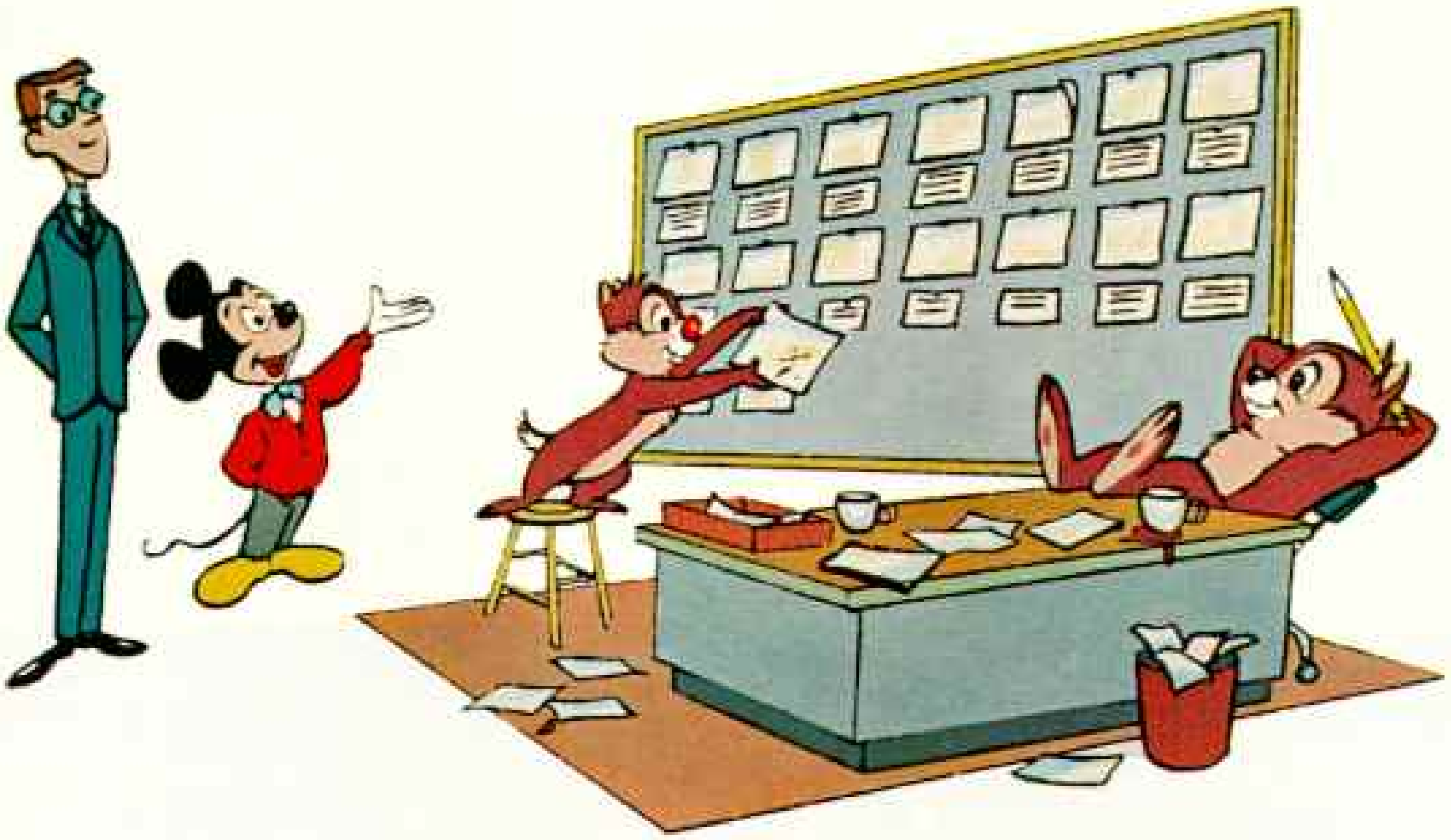
The family moved back to Chicago in 1917. Walt went to high school, attended the Academy of Fine Arts, and took correspondence courses in cartooning. He also worked at the post office sorting mail and delivering letters.

"As long as I can remember, Walt has been working," Roy Disney told me. "He worked in the daytime and he worked at night. Walt didn't play much as a boy. He still can't catch a ball with any certainty."

When Walt was 16, he joined an American Red Cross

(Continued on page 173)

"How do you make cartoons?" asked the GEOGRAPHIC Editor. In answer, the master himself picked up the telephone and summoned this rollicking troop of world-famous Disney characters. Full of squeaks and quacks, smiles and frowns, they play the roles of their animator-creators—and with high good humor poke a bit of fun at them. A pleased Walt Disney signed this GEOGRAPHIC original.



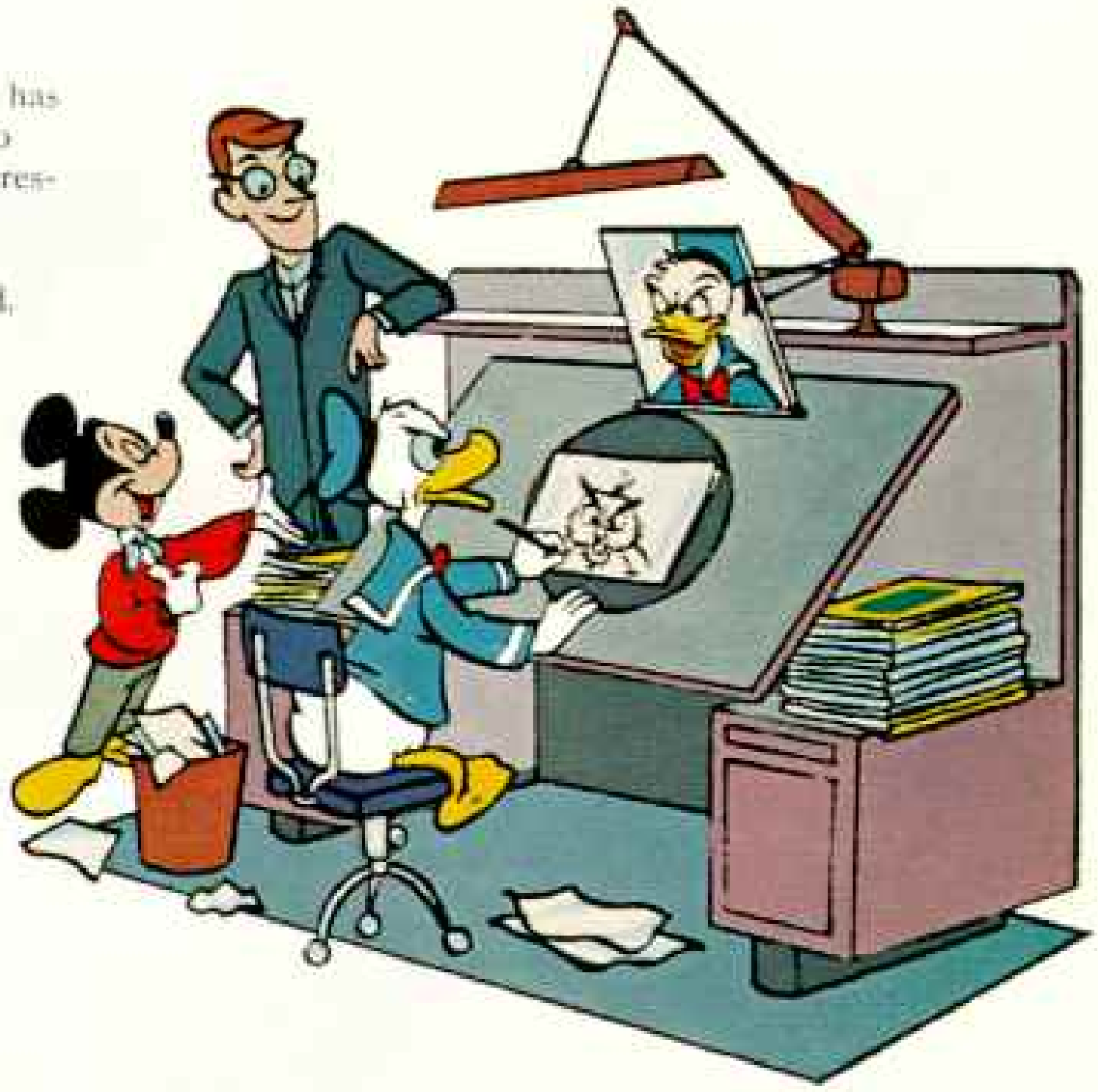
ANIMATION

Mickey Mouse explains the art to Mr. G. O. Graphic

1. Hi, Mr. G. O. Graphic—welcome to Walt Disney Studio! If you'll just follow me, I'll show you how we make our cartoon motion pictures. We start right here in our STORY DEPARTMENT. Whenever Chip and Dale get an idea, they develop it with story sketches, then pin the sketches up on a storyboard, like a comic strip. They're working on our feature-length cartoon *The Sword in the Stone*. Looks like Dale is doing all the work while Chip waits for an idea to hit him.

2. In the SOUND DEPARTMENT we record our music, sound effects, and voices. Music is important in telling a story, to give it the right mood and atmosphere. And it takes a lot of auditioning sessions to select the right voice to fit a cartoon character's personality.

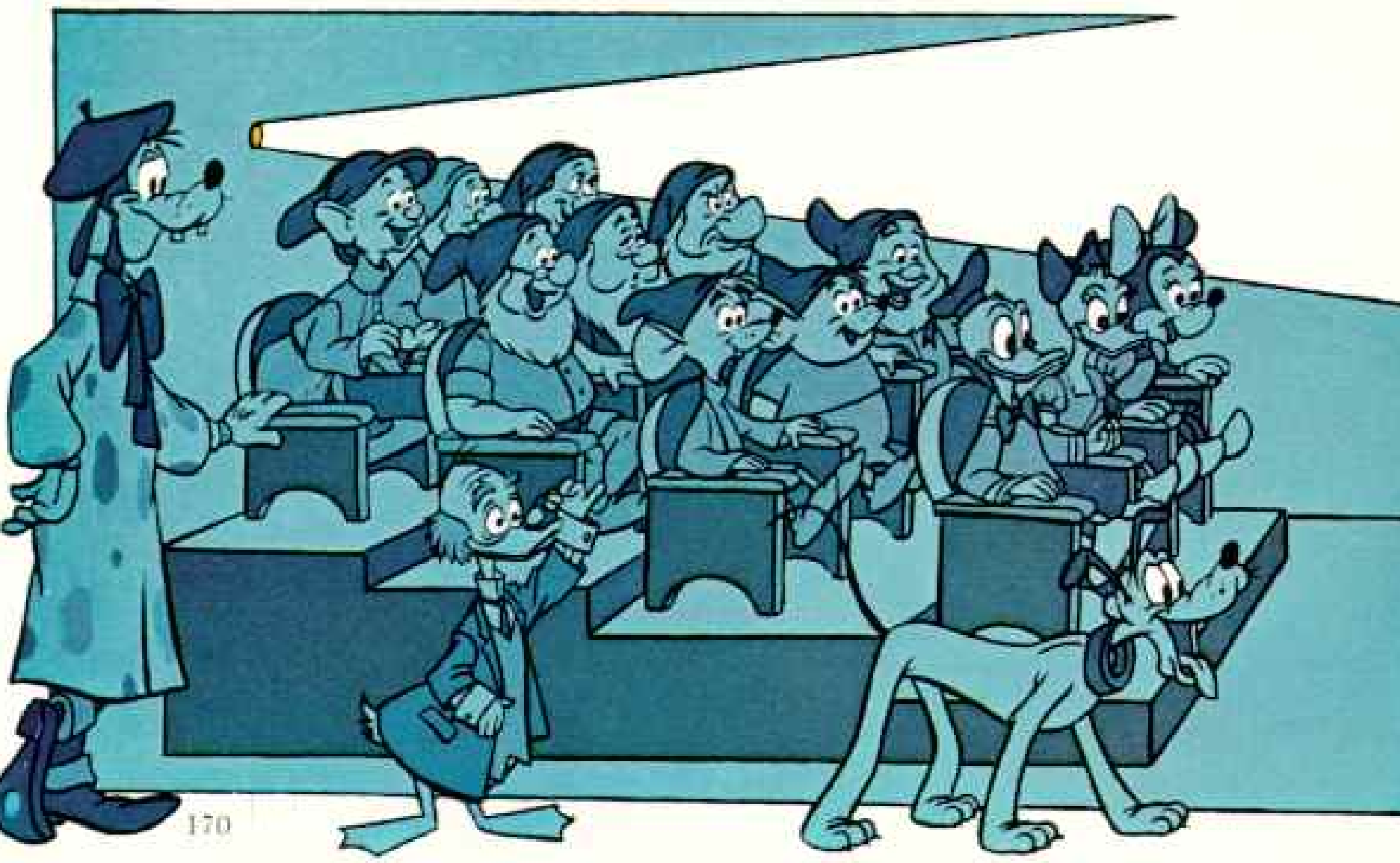
3. The ANIMATOR is the artist who puts life into a cartoon character. He has to be somewhat of an actor himself to catch just the right movement or expression in a mirror and draw it. The DIRECTOR—that's me—tells the animator how he wants the scene played. At times, Donald here has to play a crocodile or maybe an elephant. Don't be alarmed if he starts to hoot and flap his arms; today he happens to be Archimedes the Owl. To get an idea of what the real animals look like, our animators often refer to photographs in your NATIONAL GEOGRAPHIC.



4. This artist—maybe you recognize him, he's been with us a long time—is painting a background drawn by a LAYOUT MAN. Goofy gets more paint on his smock than on the paper. It looks messy, but he calls it "artistic license."

5. These pretty little girls are INKERS and PAINTERS. They trace the animator's drawings onto sheets of transparent celluloid. They use a COLOR MODEL GUIDE to paint the proper colors.

6. Our CAMERAMEN place the celluloid drawings, one at a time, over the right painted background and photograph them. This gives us a series of composite pictures of cartoon characters in appropriate settings. It takes 16 separate drawings to produce the action in each foot of film, or 1,440 drawings for just one minute on the screen. You can see that a feature-length film runs into thousands of drawings—and a big budget! In *The Sword in the Stone* 227,840 drawings are used—each one different.



7. Ludwig von Drake, our FILM EDITOR, splices the different scenes together to make a master reel.

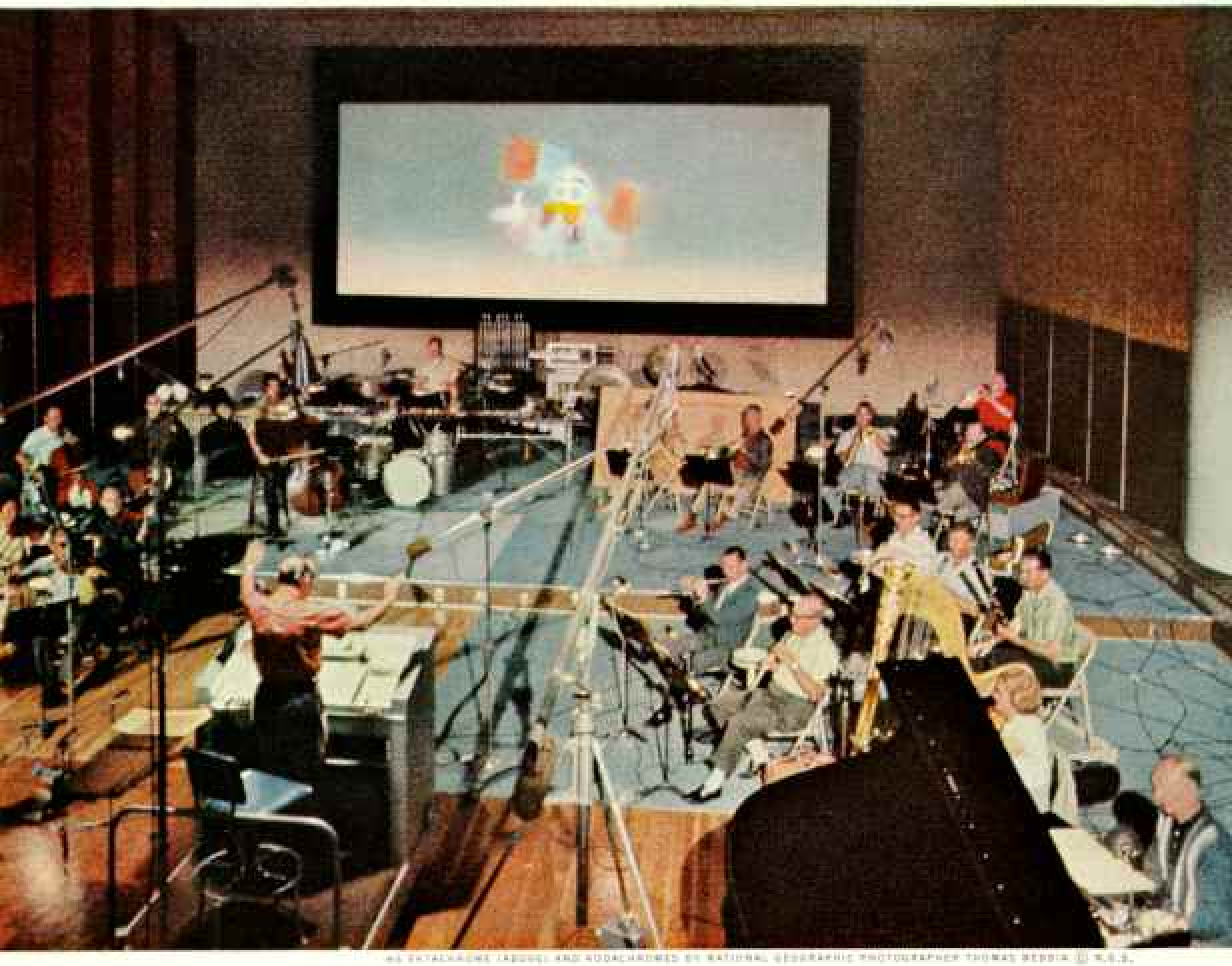
8. Look at this strip of film. You can see how many drawings it takes —18—for Archimedes the Owl to flap his wings just once!

9. Here in our PROJECTION ROOM we all look at the results. On the screen you can see a scene from *The Sword in the Stone*. If we find any changes necessary—and someone probably will—it's "back to the old drawing board." Well, let's go in and see how the picture came out!

Artist Sylvia Cobb draws on a sheet of celluloid. Her sketch, one of more than 200,000 drawings used in Disney's newest animated feature, *The Sword in the Stone*, will later be photographed over a painted background (below). Four years in the making, the musical comedy tells the story of how young King Arthur is tutored for his reign by Merlin the Wizard and Merlin's pet owl, Archimedes. The film, which is based on a book by T. H. White, will be released this Christmas.

Musicians score a cartoon as Professor Ludwig von Drake prances across a sound-stage screen. Overhead microphones pick up the individual instruments and record them on three sound tracks. A later process transfers the three to a single track.

Viselike platen holds a celluloid drawing of the long-bearded Merlin over a painted background, while an overhead camera (not shown) photographs it for a single frame of film. Each brief bit of action by a cartoon character requires hundreds of such frames. Another scene from the movie adorns the wall.



ALL DAYLIGHT (ABOVE) AND KODACHROMES BY NATIONAL GEOGRAPHIC PHOTOGRAPHER THOMAS NEBBIA © N.G.S.

unit as an ambulance driver, but he did not get overseas until after the Armistice (page 163). He had 11 months in France, then went to Kansas City and set up as a commercial artist. He finally landed with the Kansas City Film Ad Company in 1920, preparing animated commercials for silent-movie houses.

Walt recalls those days. "The pull toward Hollywood became strong. Animation was big there, and if I couldn't be successful at that, I wanted to be a director or a writer."

In 1923 he went off to Hollywood with $40 in hand, and for two months tried to hitch on at the studios. His $40 disappeared.

"Before I knew it, I had my animation board out," Walt recalls. He finally got an offer for twelve cartoons—Alice in Cartoonland—at $1,500 each.

"I talked my big brother Roy into going in with me," Walt told me. "I couldn't get a job, so I went into business for myself."

Business was good. Alice was followed by the successful Oswald the Rabbit series. Then came Mickey.

"The mouse gave us an opportunity to improve the cartoon medium," Walt says. Experiment and expansion began in 1929 with the first Silly Symphony, in which music played a key role.

Walt worked at the studio all day and every night. Only in recent years has he mastered the compulsion to work *all* the time. "I still take scripts home," he told me, "but I don't read them at night. It's a temptation to peek, but I wait until morning. I used to read at night and then worry until morning. I used to be tied up all night, but no more."

Donald Duck Becomes a Star

Walt's next enthusiasm was Technicolor's new three-color process for film. A Silly Symphony, *Flowers and Trees*, was already fully photographed in black and white. Walt decided to remake it in Technicolor. It was a gamble, since Technicolor was extraordinarily expensive.

The picture was made in color and caused a revolution in the animated-cartoon indus-

"A truly invaluable research tool," Disney calls the NATIONAL GEOGRAPHIC. "We use it all the time." Here he pulls out an issue in the studio library and from it gleans information on period costumes needed in a forthcoming film.

Balconied buildings of New Orleans Square, a future Disneyland attraction, will display the lacy ironwork shown in the February, 1953, GEOGRAPHIC. Art director Herbert Ryman uses the illustration to create a preliminary sketch.

try. In 1932 it became the first cartoon to win an Oscar. Some of Walt's funniest pictures were Silly Symphonies—notably *The Three Little Pigs* and *The Tortoise and the Hare*.

In 1934 Donald Duck made his first sputtering appearance in *The Wise Little Hen*. That egregious fellow became an immediate hit—and now has surpassed Mickey as the star of the stable.

"We're restricted with the mouse," Walt told me. "He's become a little idol. The duck can blow his top and commit mayhem, but if I do anything like that with the mouse, I get letters from all over the world. 'Mickey wouldn't act like that,' they say."

Scenes Gain Depth and Motion

As the pictures were ground out, the art of animation progressed. Characters were being drawn in the round and in perspective, as contrasted with the first flat figures. But Walt was never satisfied.

"I knew that locomotion was the key," he told me. "We had to learn to draw motion. Look, pull your hand across your face and you'll see what I mean. You don't see a single hand; it's sort of stretched and blurred. We had to learn the way a graceful girl walks, how her dress moves, what happens when a mouse stops or starts running."

Disney set up an elaborate school for his artists. "It was costly, but I had to have the men ready for things we would eventually do."

What "we would eventually do" was *Snow White and the Seven Dwarfs*, the first feature-length cartoon. When word of this project got around Hollywood, many movie people said Disney was making his biggest mistake.

"They were thinking of the shorts—thought we were just going to string some together," Walt said. "But we had a story to tell. They couldn't get that through their heads."

While his artists were training, Walt had technicians working on a new kind of camera he planned to use for *Snow White*. He was no longer satisfied with just round figures, now he wanted the illusion of depth. To achieve this, he developed the radically different "multiplane" camera—and won an Academy Award for it.

In photographing animated films, three separate drawings are usually involved, each done on a sheet of transparent celluloid. One shows the foreground, one the animated figures, and the last the background. Before the multiplane camera, the three celluloids were simply stacked together and the camera shot through them all, giving a flat image. With

Aerobats in slow-motion, three-toed sloths of the Amazon perform for photographers in the Disney film *Jungle Cat*.

Hero of *In Beaver Valley*, one of Disney's most popular nature shorts, ventures up from beneath the ice on a winter patrol of Montana's Georgetown Lake. Moments later he narrowly eluded a starving coyote.

the multiplane, more than three celluloids could be used, and they could be placed in different planes, sometimes as much as three feet apart. The camera could focus in and out among these planes to give an astonishing effect of depth and motion.

Snow White brought up a new problem. "We had to learn how to put personality into the characters," Walt told me. "Up to *Snow White*, we'd just had stock characters."

A Disney artist enlarged on the theme. "Remember in *Snow White* when the dwarfs had the pillow fight and Dopey ended up with a single feather?" he asked. "Remember how he fluffed it out and lay down with it under his head? It *was* funny, but more, it was Walt's way of expressing what kind of character Dopey is and creating audience sympathy for him."

Snow White cost one and a half million dollars, and the bankers became restive before it was completed. Walt reluctantly had to show a man from the bank the unfinished product to try to retain their confidence.

"We needed a quarter of a million dollars to finish the picture, so you can guess how I felt.

"He sat there and didn't say a word," Walt told me. "Finally the picture was over and he walked to his car, with me following him like a puppy dog. Then he said, 'Well, so long. You'll make a pot of money on that picture.' So we got the money."

Snow White and the Seven Dwarfs (page 165) went on to make theatrical history and brought many honors to Disney. In 1938 Yale gave him an honorary master of arts. In presenting him as a candidate for the degree, Professor William Lyon Phelps said:

"One touch of nature makes the whole

© WALT DISNEY PRODUCTIONS

Lord of the Amazon, a jaguar proves as agile in the treetops as on the ground. Photographers armed only with cameras recorded the beast's life cycle in *Jungle Cat.*

Dive-bombing falcon swoops down on a prairie dog in *The Vanishing Prairie,* filmed in South Dakota, Wyoming, and Montana. Racing for its tunnel, the rodent barely escapes the bird's needlelike talons.

Tarantula and rattlesnake square off in a scene from *The Living Desert.* The battle—rarely seen, much less photographed—ended in a draw. Patience is a requisite for Disney nature cameramen; one team waited six weeks for an alligator's egg to hatch.

world kin, and Walter Disney has charmed millions of people in every part of the earth. . . . He has endeared America to the hearts of foreigners."

That same year brought honorary degrees from Harvard and the University of Southern California. (In 1960 Walt received an honorary diploma from the Marceline, Missouri, high school, which was pleasant, since he had never finished high school.)

After *Snow White* came other feature-length cartoons: *Pinocchio*, *Fantasia*, and *Bambi*. *Fantasia*, released in 1940, started out to be a kind of super Silly Symphony for Mickey Mouse, with Leopold Stokowski directing a full orchestra in *The Sorcerer's Apprentice*. Walt built it into something more, a brilliant combination of animation and fine music—from Beethoven's *Pastoral Symphony* to Stravinsky's *Rite of Spring*. *Fantasia* introduced stereophonic sound 15 years before it was generally used in motion pictures.

Bambi Points Way to Nature Films

Bambi was the fictionalized story of a deer, and the animal studies it involved made it the forerunner of one of Disney's most important contributions: the True-Life Adventure films, about live animals in nature.

"One thing always leads to another around here," Walt told me. "In *Snow White*, we had cute little animals, more on the fantasy side. In *Bambi* we had to get closer to nature. So we had to train our artists in animal locomotion and anatomy."

Walt introduced live animals into the studio, deer and rabbits and skunks. "But they were no good," he says. "They were just pets. So we sent the artists out to zoos, and all we got were animals in captivity. Finally, I sent out some naturalist-cameramen to photograph the animals in their natural environment.

"We captured a lot of interesting things and I said, 'Gee, if we really give these boys a chance, I might get something unique!' "

But the war intervened: Walt Disney Productions became virtually a war plant for the duration. Disney training films for the Army and Navy, pictures for bond drives, and similar projects made an important contribution to our war effort.

As one of his first postwar projects, Walt sent Alfred Milotte and his wife Elma to Alaska. They sent back miles of film. In the footage—or mileage—Walt stumbled on one of the great stories of nature: the saga of the fur seals coming up from the sea to crowded island beaches in the Pribilofs, there to calve and mate.

The Milottes caught the cruel and mysterious reality of the fur seal—the courting and mating, the fury of the bulls defending their harems against bachelor seals, with babies being trampled and crushed in the turmoil. And, in the end, the eerie disappearance of the herds into the sea.*

The picture was *Seal Island*. It won an Oscar as 1948's best two-reel subject.

This success was followed by another, *In Beaver Valley*. Walt will go to the nth degree to get perfection, and for this film he kept cameraman-naturalist Milotte in the wilds for more than a year, studying the beaver's life habits as he photographed. Out of Milotte's footage came the story of a talented, fascinating animal (page 175).

The True-Life Adventure pictures used techniques learned in cartoons.

"Any time we saw an animal doing something with style or personality—say a bear scratching its back—we were quick to capitalize on it," says a Disney writer. "Or otters sliding down a riverbank—humorous details to build personality.

"This anthropomorphism is resented by some people—they say we are putting people into animal suits. But we've always tried to stay within the framework of the real scene. Bears *do* scratch their backs and otters *are* playful."

Old Indian Trick Still Works

The cameramen spent months in primitive areas, in African heat, in Alaskan blizzards, in South American jungles. A film by Murl Deusing for a National Geographic Society lecture formed the basis of many important sequences in *Nature's Half Acre*, and many of the Society's lecturers over the years have contributed footage to Disney nature films.

Disney's cameramen-naturalists worked with telescopic lenses, zoom lenses, time-lapse cameras, and underwater cameras; from behind elaborate blinds, high in the treetops, and from fixed platforms.

Tom McHugh, photographing a buffalo herd for *The Vanishing Prairie*, found he could not get close enough, even with a telescopic

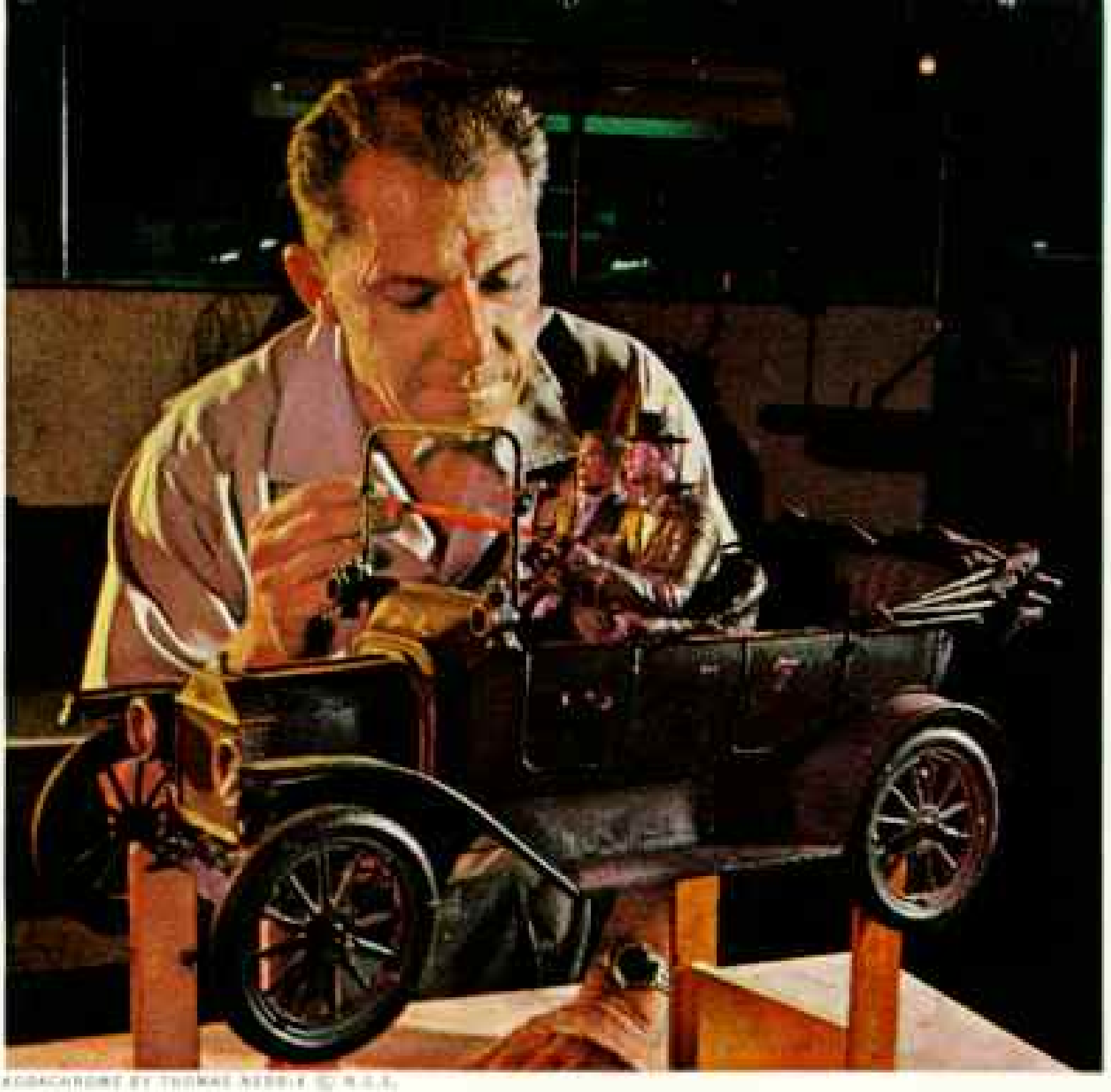
(Continued on page 183)

*See "The Fur Seal Herd Comes of Age," by Victor B. Scheffer and Karl W. Kenyon, NATIONAL GEOGRAPHIC, April, 1952.

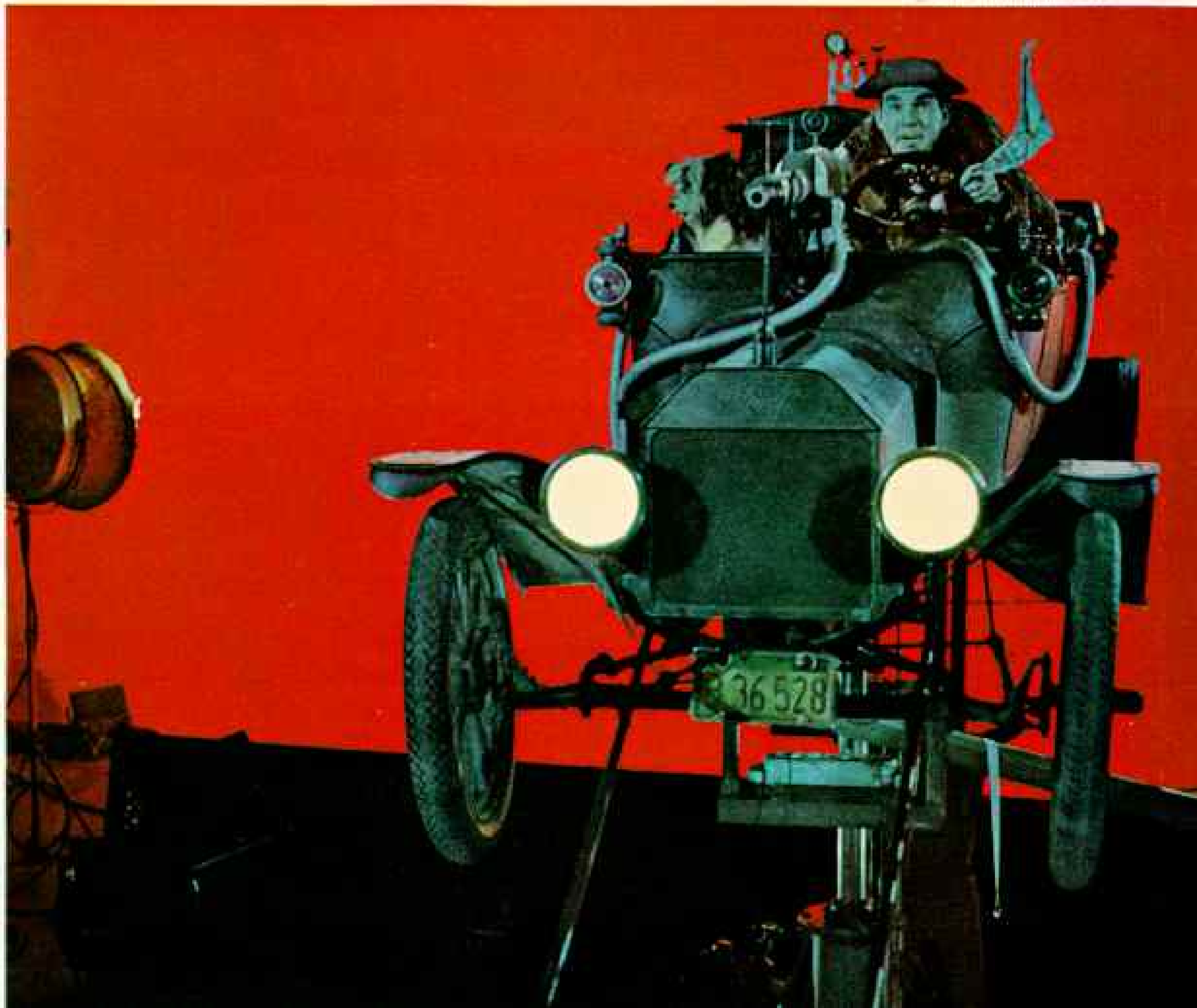
Toy Model T Flies in *Son of Flubber*

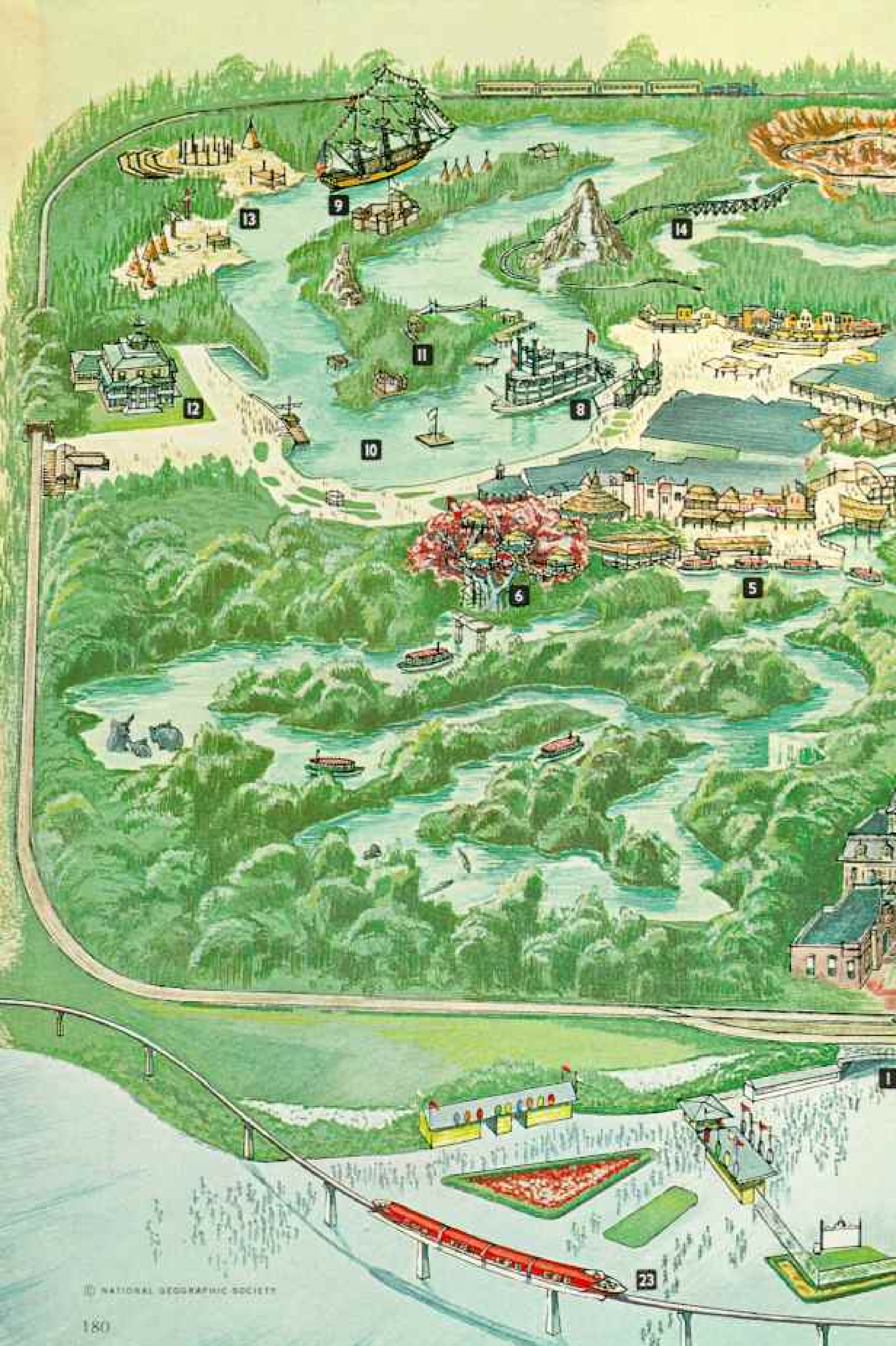
Miniature car, flown by remote control, appears only in long-distance shots. Plastic figures resemble actors Fred MacMurray and Tommy Kirk. Technician Bob Mattey prepares the vehicle for the cameras.

Full-size Model T poses for close-ups with MacMurray and his dog. Mounted on a hydraulic ram, it moves up or down, revolves 360°, tips in any direction. Shot against a special red screen, the action can be combined with any background.



KODACHROME BY THOMAS NEBBIA © N.G.S.





Disneyland

A WALKING TOUR

WORLD OF TODAY vanishes in a unique park. Here there is no present—only nostalgic past, hopeful future, and the miracle of times that never were.

The visitor steps through the gates 1, beneath the Santa Fe and Disneyland Railroad 2, down the turn-of-the-century Main Street, U.S.A. 3, to a circular Plaza 4, the hub of Disneyland's four realms.

ADVENTURELAND
Jungle Cruise 5 carries would-be explorers down crocodile-infested waters. Swiss Family Tree House 6 towers 70 feet. In the Enchanted Tiki Room 7, birds and flowers sing.

FRONTIERLAND
Steamboat *Mark Twain* 8 and full-rigged *Columbia* 9 ply Rivers of America 10. Rounding Tom Sawyer Island 11, they pass the Haunted Mansion 12 and the Indian Village 13. Pack mules and mine trains wend Nature's Wonderland 14.

FANTASYLAND
Bridge through Sleeping Beauty Castle 15 leads to Mad Hatter's Tea Party 16, Dumbo, the Flying Elephant 17, Pirate Ship 18, Casey Jr. Circus Train 19, canal boats of Storybook Land 20, and Skyway Ride 21. Bobsleds zoom down the Matterhorn 22.

TOMORROWLAND
Monorail trains 23 whisk past "nuclear" submarines 24, Flying Saucers 25, and an 80-foot rocket 26 poised for a simulated flight to the moon. Miniature cars race over the Autopia 27. Special exhibits: America the Beautiful 28 and the Art of Animation 29.

Disneyland is not completed and never will be. "It will grow as long as there is imagination left in the world," vows Walt Disney.

Ustin L. Barrett STAFF ARTIST

Windjammer and Stern-wheeler Circle Tom Sawyer Island in Frontierland

Youngsters seeking excitement find it on the tree-clad island: They can angle for real fish in Catfish Cove, bounce across a gorge on a suspension bridge, peer down into the bottomless pit in Injun Joe's Cave, climb into Tom and Huck's Tree House, and explore Fort Wilderness. Log raft at left foreground ferries visitors to and from the island.

Flower-banked paths rim the Rivers of America. Botanically, it is always spring or summer in Disneyland. A staff of 30 gardeners tends some 700 species of trees, shrubs, and flowering plants as well as half a million annual and perennial blooms.

◀ THIS PAGE FOLDS OUT

lens. Then he remembered an Indian trick. He covered himself with a buffalo skin and sneaked in for close-ups.

James Algar, the writer and director of *The Vanishing Prairie*, recalls being surrounded by the torrential rush of buffalo.

"I'd always heard of the thundering herd, and the herd thundered all right. But what I had never heard of was the sibilant, silken swish which accompanies the stampeding buffalo. It was even more terrifying than the thunder."

Alfred and Elma Milotte spent almost three years in Africa photographing *The African Lion*. One of their notable sequences shows a rhinoceros bogged in a water hole, helpless and raging. The exertions and grunts of the doomed rhino attracted an audience of jungle creatures. Birds added their raucous cries. Antelope watched. An elephant surveyed the scene, panicked, and ran away. A baboon sat on the bank thoughtfully, as though trying to contrive some plan that would be of help.

Enraged Rhino Charges Benefactors

In the film the rhino was left to die. Actually, the Milottes decided to rescue him. Dodging the desperate animal, they got a stout rope under his head and rump, tied the line to a truck, and pulled him free.

The rhino was ungrateful. Once on dry land, he charged the truck, and they barely managed to get away.

The Milottes brought back much distinguished footage. They recorded a leopard lurking in a thorn tree above a herd of wildebeests, showed him drop on a calf and drag it back into the tree for his meal. They also filmed the kill of an antelope by a lion.

Other outstanding film records were produced by Disney's naturalist-photographers: a bobcat in hot pursuit of a marten; the private lives, births, mating, and the search for food of the pine squirrel, golden eagle, raccoon, and crow; a goshawk striking a flying squirrel in mid-air.

BY PERMISSION OF NATIONAL GEOGRAPHIC PHOTOGRAPHER CHUCK NICKLIN © N.G.S.

They also recorded a goshawk slamming into photographer Paul Kenworthy's shoulder as he worked high in a tree to film close-ups of its young.

As the technique improved, the photographers worked in compounds—sometimes as big as 50 acres. "It was a short cut," a writer told me. "We're not faking nature. We gave the animals the opportunity to appear before the camera.

"Take the spectacular shot of the screaming bobcat scrambling to the top of a saguaro in *The Living Desert*. It may have been taken in a compound—but it wasn't faked. The cat streaked up that cactus because he was frightened by wild pigs.

"When we follow the animals underground, we of course expose their tunnels. In *Perri*, the squirrel goes underground. We spent days conditioning her to the bright lights needed for color photography. Then, when we came to shoot, she didn't pay any attention to us. We wondered if she had needed conditioning at all."

"Our naturalist-photographers probably wound up knowing as much about animals they photographed as anyone around—including the scientists," Walt said. "I don't think there's an animal on the North American Continent we don't have coverage on."

Merely documenting the lives of wild creatures was not enough. The cameramen's foot-

age contained drama, but it took the dramatist's hand to make it coherent.

A fascinating fragment of one of Walt Disney's critiques taken down during a screening of *The Living Desert* survives and shows him at work:

"In sequence where tortoises are courting, Walt said: They look like knights in armor, old knights in battle. Give the audience a music cue, a tongue-in-cheek fanfare. The winner will claim his lady fair. . . .

"*Pepsis* wasp and tarantula sequence: Our heavy is the tarantula. Odd that the wasp is decreed by nature to conquer the tarantula. When her time comes to lay eggs, she must go out and find a tarantula. Not strength, but skill helps her beat Mr. Tarantula. . . .

"Then the hawk and the snake. Our other heavy is the snake. . . . With wasp and tarantula it's a ballet—or more like a couple of wrestlers. The hawk should follow. Tarantula gets his and then Mr. Snake gets his. . . . *Pepsis* wasp doesn't use brute strength, but science and skill. Should be ballet music. Hawk uses force and violence. One could follow the other and have a different musical theme as contrast."

Nature Documentaries With a Plot

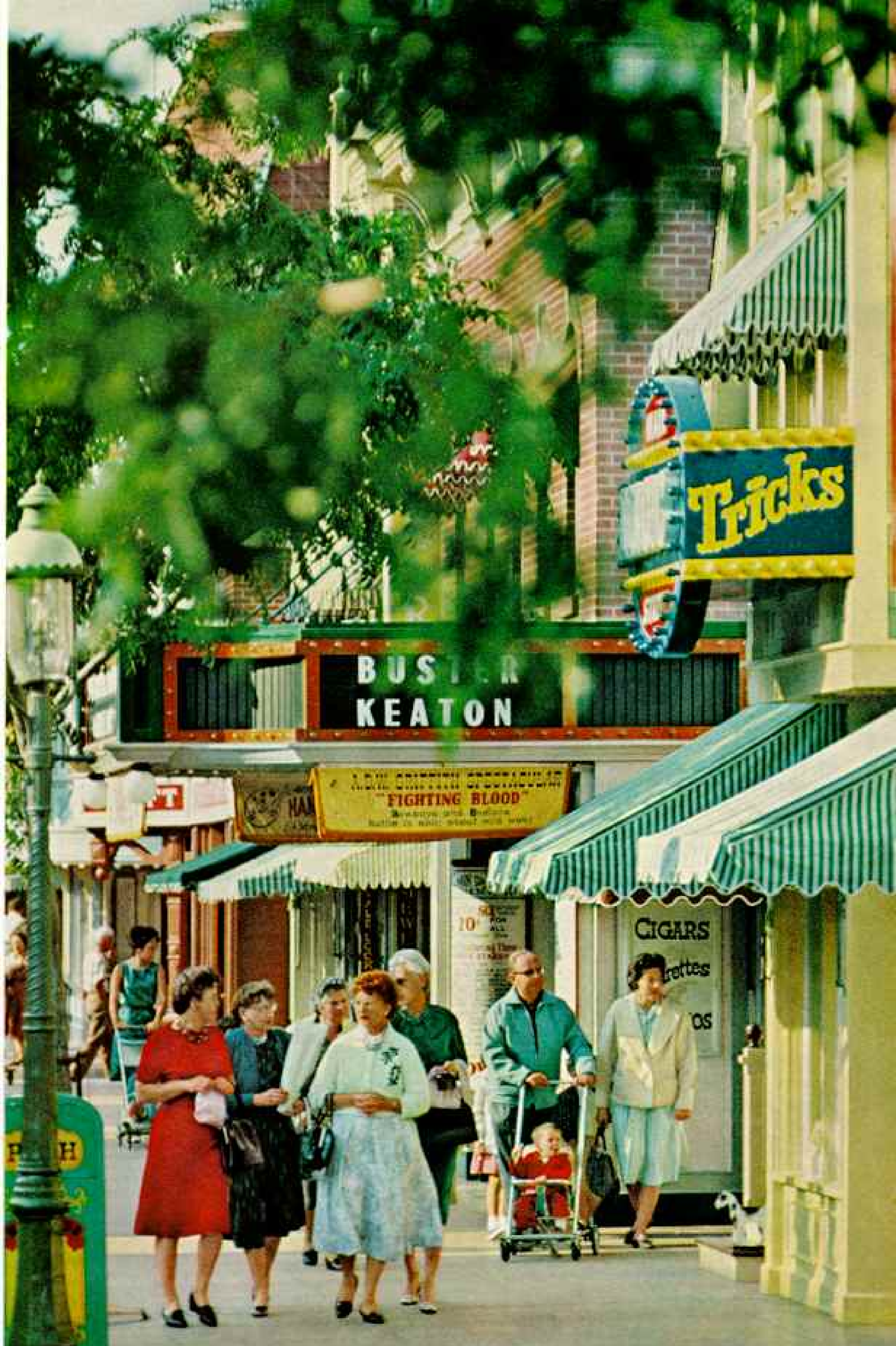
Walt has an amazing capacity to dramatize his work. When he is in a story conference, he takes the parts himself. Before *Snow White* he gave a four-hour performance of the entire picture, taking all the parts from Snow White to the smallest rabbit.

"That one performance lasted us three years," an animator told me. "Whenever we'd get stuck, we'd remember how Walt did it that night."

Next Walt Disney laid plans for a new kind of animal picture. "We decided to combine nature's truth with fiction," Walt told me.

Disney's supersecret hideaway, an apartment above the firehouse in Disneyland, has never before been photographed. Furnishings of the early 1900's match the mood of Main Street (opposite). Grandchildren play under the eye of Mrs. Walt Disney as grandfather telephones.

Gas lamps light an old-time street lined by movie theater, tobacconist, apothecary shop, ice-cream parlor, and penny arcade and candy store—each building scaled to 65 percent true size. Visitors see mustachioed policemen in thimble hats strolling the sidewalks as horse-drawn trolleys jingle past.


Tricks
BUSTER
KEATON
"FIGHTING BLOOD"
CIGARS

Sprouting mouse ears testify that this young Disneylander is a Mouseketeer, a fan of Mickey's.

"**Up above the world you fly,** like a teatray in the sky," recited the Mad Hatter in the story of *Alice in Wonderland.* Riding aluminum gondolas attached to overhead cables, Skyway passengers heed the Hatter as they soar over the scenic canals of Storybook Land where the Pirate Ship anchors, its Jolly Roger fluttering from the top mast. The aerial link between Fantasyland and Tomorrowland, first of its kind in the United States, cuts through the heart of the Matterhorn (pages 194-5).

"We would use the documentary material straight from nature, but give it a plot."

Perri, the story of a squirrel, by Felix Salten, who also wrote *Bambi*, was the first of these. Naturalist-photographers spent three and a half years in the Uinta Mountains of Utah, filming the life cycle of every animal in the cast. They sent back more than 200 miles of film!

"Just viewing their films took weeks," Winston Hibler, the co-producer, told me. "Then it took painstaking editing to fit the film to the story. And by adding music and animation, we produced a paradox—a true-life fantasy."

Perri was followed by a continuing series of similar pictures that tell stories about animals in relation to man.

"The animals have names and we kind of pull for them," a writer told me. "Stories are believable as long as the audience knows the things actually happened. We have to contrive to get the animals to do what the plot calls for without their appearing to be trained animals. But we aren't asking them to talk.

"In *The Legend of Lobo*, for example, the script called for the main character, the wolf, to walk a narrow log spanning a deep chasm. This was achieved by training the wolf, first to walk across a log near the ground, then to continue to cross the log as it was raised higher and higher.

"When the picture was shot, the wolf actually crossed a log about 75 feet long spanning a chasm several hundred feet deep."

From animal pictures Walt Disney has gone on to live-action pictures about people on an astounding variety of subjects.

Disney stuck to timeless pictures at first: *Treasure Island*, *Robin Hood*, and *Davy Crockett*—films which can be released many times. "Then I got to thinking, 'When it comes to making comedy, we're the ones'; so we did *The Shaggy Dog*. So far it's been seen by 55 million people." The live-action comedies closely follow the Disney cartoon techniques. "We've always made things fly and defy gravity," Walt told me. "Now we've just gone on to flying flivvers, floating football players, and bouncing basketball players."

The geographic scope and variety of the Disney activities are awesome. Besides a company in the Burbank studio filming a new movie called *Summer Magic*, Walt had camera crews in Florida, Yellowstone Park, and New England, a complete production unit in Canada for *The Incredible Journey*, a production unit in Majorca and another in Vienna, a feature cartoon in the works, plus four television cartoons, and a Western being shot at the studio ranch.

I had been told that Walt makes all major decisions on all his pictures, and I wondered how he kept track of things.

I found out when I sat in with him as the "daibies"—excerpts from various pictures—were projected. About fifteen of the staff—musicians, directors, song writers, producers, and writers—came in.

We listened to Burl Ives sing "The Ugly Bug Ball" a dozen times as the camera covered him from different angles. Sad Sam, the original shaggy dog, appeared on the screen with a caterpillar on his nose. We saw a scene from a Western played over and over from different points of view. The dogs in *The Incredible Journey* went through their paces.

Disney himself, in full color, flashed on the screen in a lead-in for his television program, *The Wonderful World of Color*. He began suavely and then blew his lines.

"I'm not only getting wrinkles," he said from the back of the room, "I'm losing my eyesight, too." He told a cameraman, "Don't use that diffusion on me. I look out of focus. Let the wrinkles show."

We were in the projection room two hours. This, I learned, was how Disney keeps on top of his many projects. His men send their product to be appraised. A shipment of film from Europe arrives every Tuesday. Walt also makes frequent trips to Europe and flies key personnel to the studio for conferences. He is not a memo-writing man.

"After we tie down the shooting script, it's up to the boys to make the pictures," Disney told me. "If they run into trouble, I always tell them, 'If you bring me a problem, have a solution.' Lots of times, their solution is the answer and it's just a matter of saying O.K."

Magazine a Friend to Researchers

On one of my first trips around the studio, I saw the NATIONAL GEOGRAPHIC almost everywhere I went: in the animators' offices, in the machine shop, on writers' desks. I saw it in the wardrobe department, where it's used in designing the correct clothing for various

countries, and in the staff shop at Disneyland, where the realistic animals are cast for Adventureland.

"Looks like I planted them," Walt said, "but we really use the GEOGRAPHIC. We couldn't be in business without it" (page 174).

When I dropped into the library to inquire about the meticulous research that backs up every Disney picture, Koneta Roxby, the chief of research, told me: "The GEOGRAPHIC is one of our basic research sources. We use it almost every day.

"We certainly used it when Disneyland was being built," she went on. "This library was a madhouse. There would be ten or fifteen people waiting in line for research materials and, of course, the phone rang every minute."

Disneyland really started more than 20 years ago, when Walt got the idea for an amusement park that grownups as well as children would enjoy.

"I had all my drawing things laid out at home, and I'd work on plans for the park, as a hobby, at night."

At the time, amusement parks were dying all over the country. "I talked Disneyland, but no one could see it," Walt recalled. "So I went ahead and spent my own money."

In 1954, for the site of his kingdom, Walt bought 244 acres of land—mostly orange groves—25 miles from Los Angeles, near

Shrieks of joy resound as riders twirl like tops at the Mad Hatter's Tea Party (below), splash through a glacial lake at the foot of the Matterhorn (right), and bounce in air-cushion cars known as Flying Saucers (lower right).

Anaheim, California. "I wanted flat land that I could shape," he said.

He surrounded the entire park with a high earth embankment. "I don't want the public to see the real world they live in while they're in the park. I want them to feel they are in another world."

When the preliminary plans for the park were completed, the cost estimate was $4,700,000, but Joe Fowler, who is in charge of Disneyland, says, "That was only a guess." The over-all cost to date is approximately forty-four million dollars!

Disneyland: the Geography of Imagination

At the Disneyland opening, in July, 1955, a year after the first orange tree was uprooted, Walt said, "Disneyland will never be completed. It will grow as long as there is imagination left in the world." It seemed, at the time, a pleasant sentiment, but few took it literally. Walt did, and that is why Disneyland remains unique; he is forever enlarging it (painting, pages 180-82). Now he is building an old New Orleans Square, complete with a bayou boat ride.

Disneyland, on a fall day, is full of warmth and zest. I paid my respects to the giant portrait of Mickey Mouse, in living flowers, that adorns the slanting earth embankment at the park's main entrance.

I stepped into the Town Square—and right into Walt Disney's childhood. The Square with its red-brick Victorian elegances is a

Canopied launch glides past Cambodian temples on the Jungle Cruise, a simulated safari by boat down the Mekong, Nile, Congo, and Amazon Rivers. Live rubber trees, giant bamboos, and brilliant blooms of the hibiscus crowd the banks.

Jaws Agape, Hippos Threaten a Cruise Boat

At every bend make-believe danger awaits: head-hunters brandish spears, gorillas thump chests, bull elephants trumpet madly.

Wide-eyed with wonder, youngsters peer out at a rain forest. "Approaching the rapids, we may not make it!" shouts the captain. But every launch returns.

Mountaineer Jeff Winslow Scales the Mighty Matterhorn Eight Times Daily

Roped for safety, Winslow ascends the 146-foot peak on pitons driven into its concrete shell. Cloverleafs of the junior Autopia circle near a "nuclear" submarine (right). Below the climber, visitors board bobsleds for a breathtaking ride through the hollow mountain.

distillation of Walt's early memories of Chicago and Marceline and Kansas City shortly after the turn of the century.

A gaily cockaded band was tootling. A horsecar rolled along, the horse's rubber shoes making muffled thumps; a double-decked bus stood at the curb; and a balloon seller, hidden behind a great cluster of his wares, looked like a gigantic chrysanthemum. Over a loud-speaker from the Santa Fe and Disneyland Railroad station came the measured voice of the train announcer:

"... now leaving for Adventureland, Frontierland, Fantasyland, and Tomorrowland—all aboarrrd!"

Main Street, U. S. A., sets the tone and pace of Disneyland: It is a place for strolling (page 187). People stop to peer into the windows of the apothecary shop and the old-time general store, and to look over the shoulder of a sidewalk artist as he sketches a portrait. Most of the visitors are grownups. As the park statistics prove, adult guests outnumber children three and a half to one.

Visitors Fooled by Live Swans

At the end of Main Street, faraway jungle noises made me turn to the left and enter Adventureland.

I took the jungle river cruise (pages 192-3) aboard the sturdy river boat *Ganges Gal*, which chugged past menacing crocodiles, a

Sparkling paint keeps the Matterhorn perpetually snowcapped; push buttons regulate waterfalls. Skyway cars ride through Glacier Grotto.

ruined temple, and a group of bathing elephants. Gorillas and a tremendous African elephant roared from the tropical vegetation which choked the banks of the stream.

There was some discussion among the passengers about the animals. Were they real? (They were, of course, animated.) But in Disneyland, it is sometimes hard to know where fantasy ends and reality begins. A little later, I watched a pair of ladies peer intently at the live swans sailing on the moat of Sleeping Beauty Castle.

"They are not real," one lady finally said with authority.

I met Bill Evans and Ray Miller, landscape architects for the park, and complimented them on the effects they have created along the jungle stream. They have made Disneyland a must for visiting horticulturists. The park has close to 700 species of plants. It takes at least 30 gardeners to keep them in trim.

We wandered to the base of the Swiss Family Tree House, which opened last fall. I asked what kind of tree it was.

"It was modeled after the banyan tree, *Ficus benghalensis*," said Ray Miller, "but we call it *Disneyodendron eximius*, which means an out-of-the-ordinary Disney tree."

The 70-foot tree is a copy of the Swiss Family Robinson's tropic domicile, complete with furniture salvaged from their ship.

I took a short cut through Frontierland (pages 183-5) just in time to be caught in the middle of a running gun fight between a rootin'-tootin' sheriff and a Western bad man. Happily, they were using blank cartridges, or the slaughter would have been awesome.

The *Mark Twain*, the stately white river packet, was just leaving her dock for a cruise on the Rivers of America. Across the water, I saw some energetic boys romping on Tom Sawyer Island, while others helped Indians paddle war canoes or rode the high-sided keel boats, the ones used in Disney's *Davy Crockett* movie and television series.

In Fantasyland (pages 188-9) I found myself face to face with larger-than-life-size impersonations of famous Disney characters: the Big Bad Wolf, one of the Three Little Pigs, Minnie Mouse (page 202). The Mad Hatter, his rubber jowls quivering, was trapped in a corner. He was having a hard time defending himself against a mob of children.

The Most Marvelous Submarine

In Tomorrowland, I boarded the submarine *Skipjack*, one of eight submersibles in the Disney fleet. It took me on one of the incredible journeys of the world, though it was made in a mere six million gallons of water rather than an ocean.

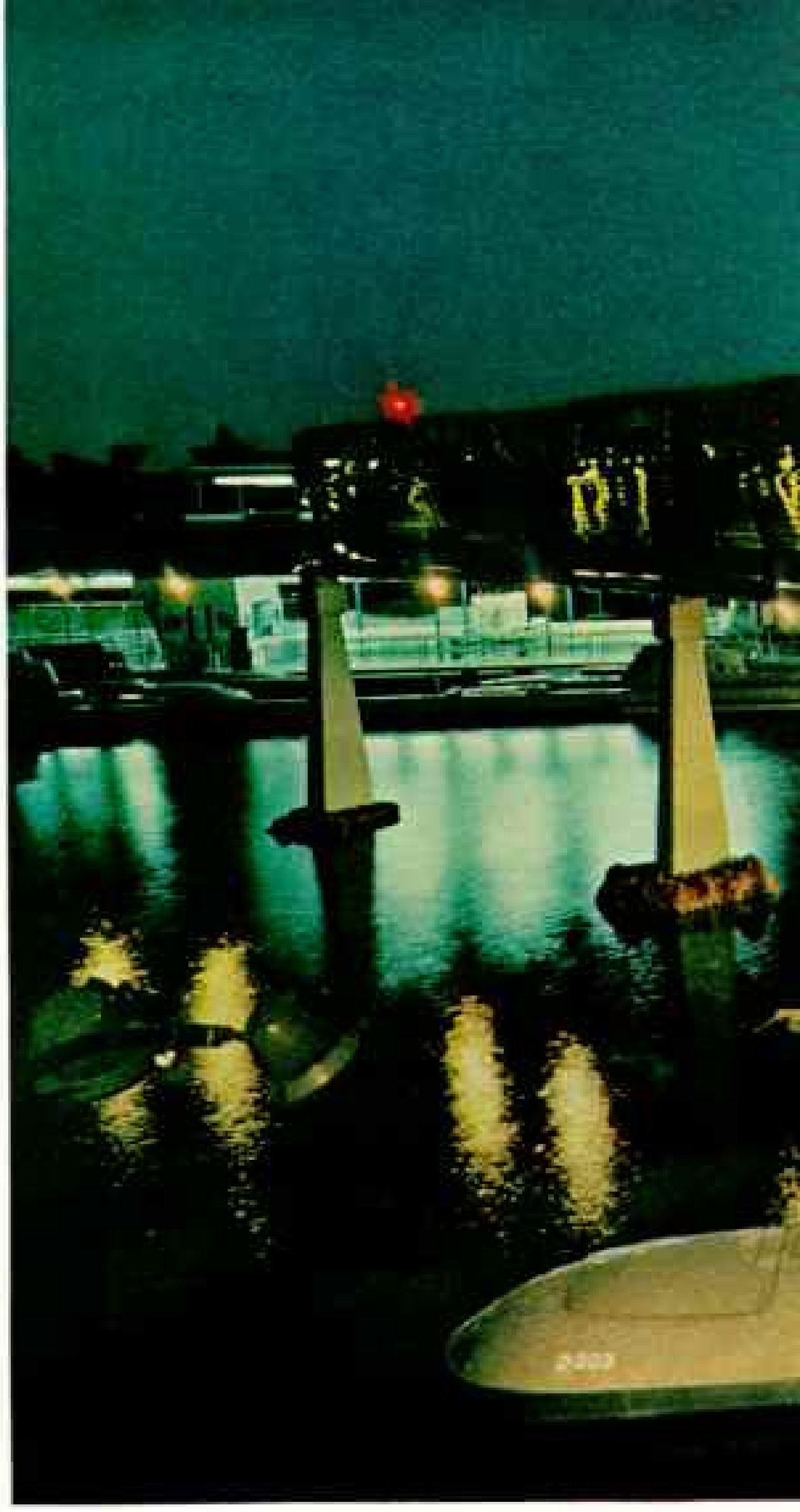
The sub "went under" in a swirl of bubbles and sailed serenely (guided by sonar, the skipper said) through treacherous coral reefs ablaze with animated tropical fish. Giant turtles dined on sea grass. Barracudas, sharks, and a dangerous moray eel loomed from the shadows. In a plunge to the abyss, we saw phosphorescent creatures of the deep.

We passed through the hull of a sunken ship and glimpsed chests filled with gleaming treasure. And, as the skipper explained that we could not expect to see mermaids since they were only figments of imagination, we nosed impolitely into a mermaids' boudoir (opposite).

The sub visited the lost continent of Atlantis, went under the polar ice cap, and finally passed what may be the largest sea serpent in the world. Certainly the largest *cross-eyed* sea serpent.

When I talked with Joe Fowler, the retired admiral who is vice president for Disneyland operations, he said his former Navy colleagues are delighted with the submarines. One, a sub skipper, said, "That's the only time I've ever been on a sub and could see where I was going."

"We were apprehensive that some guests



20th-century Transit, Monorail Train and "Nuclear" Sub Pass in the Night

America's first daily-operating monorail train travels on a concrete beamway, attaining 45 miles an hour on straightaways. Gliding noiselessly, it journeys 2½ miles on a winding circuit through Tomorrowland to Disneyland Hotel, just outside the park.

"Dive! Dive!" roars the squawk box of the *Skate* as it skims over its coral lagoon. The order sounds real, and it is—tape-recorded on a U. S. Navy submarine in action. Running on a submerged track, the vessel seems to embark into liquid space. Passengers peer through portholes at the drowned continent of Atlantis and a graveyard of ships. They hear the grunts, whistles, and clicks of fish and shrimp—again genuine sounds recorded in ocean depths.

Snow-white mermaids with flowing tresses preen with mirrors and try on necklaces found in sunken treasure chests.

PHOTOGRAPHED BY THOMAS NEBBIA © NATIONAL GEOGRAPHIC SOCIETY

might suffer from claustrophobia in the subs," Fowler told me. "But in my Navy experience, I had learned that few people suffer from claustrophobia if you have moving air and something to see. That's why there's an air jet in front of every porthole."

How to Build a Mountain

Fowler has one besetting problem: "Almost everything we undertake in the park has never been done before," he told me.

He cited the Matterhorn as an example (pages 194-5). The 146-foot-high mountain, which is one hundredth the height of the real Matterhorn, contains 500 tons of structural steel, and almost no two pieces are the same length, size, or weight.

The Disney Matterhorn is a close copy of the real mountain. Disney designers studied hundreds of pictures of the rugged peak, pictures taken during the filming of *Third Man on the Mountain*. Like the original, it also has its mountain climbers, athletes in alpine attire who scale and rappel it eight times daily.

Whereas the real Matterhorn is extremely solid, the Disneyland version is hollow and houses an exciting bobsled ride.

I rode one of the bobsleds and was lifted high inside the mountain. Then my bobsled dipped over a sharp edge and I was on my own—moving around curves, through icy grottos, past waterfalls, and under the Skyway's ski-lift buckets, which take visitors through the mountain for a view of the ice caves. Finally my bobsled dashed into a tumbling mountain stream, which braked it, and the ride was over.

One of the greatest attractions is the Disneyland-Alweg Monorail System which loops in and out of the park (page 197). Disney and Alweg engineers collaborated in the design, and the trains were built at the Disney studio. The monorail is the first of its type—a "piggy-back" design in which the cars are locked to the track.

I rode the monorail from the Disneyland Hotel to the park several times. A uniformed girl handed me aboard the long silver train. It started gently, smoothly. We glided over the magic kingdom at 20 miles an hour, silently surveying the wonders below like some satellite from space. Most passengers, myself included, leave the monorail

Ageless as the fictional fairy, 72-year-old aerialist Tiny Kline plays Tinker Bell harnessed to a cable (opposite). But she travels to work by bus: "I'm afraid to ride in a car on the freeways," she says. "They're not safe."

Tinker Bell soars over Sleeping Beauty Castle. Fireworks explode a shower of color each summer evening when Peter Pan's good fairy flies down from the Matterhorn.

Western Mine Train rides a trestle across Bear River in Nature's Wonderland. Passengers see beavers building dams, bull elk in battle, Gila monsters, peccaries, and marmots—all animated figures.

Diving for dinner (upper right). Disney-built brown bear catches a trout while another draws a bead on a leaping fish.

Colored fountains spout high among glistening stalagmites and stalactites in Rainbow Caverns, the climax of the Mine Train tour.

convinced it is the answer for rapid transit of the future.

I wandered backstage at Disneyland to visit Bud Washo, the head of the staff shop. There I got a glimpse of the Disney future, though its subject matter in this case was the dim past.

At WED Enterprises in Glendale, where all the design work for Disneyland is done, I had watched Blaine Gibson modeling a series of small-scale dinosaurs, cave men, and other prehistoric creatures. Now Bud Washo took me into a barnlike room where Gibson's dinosaurs were being re-created—life-size. An enraged *Tyrannosaurus rex* with a two-foot mouthful of six-inch teeth is something to stand beside—even if it is just clay.

Once the clay figures are completed, plaster molds are made, and then the carefully detailed skin is cast from 3/8-inch Duraflex, which Washo described as a "hot-melt vinyl reformulated for strength."

"Hardly anything affects it," Washo said. "It can take weather, most oils, or gases. It's enormously flexible and durable."

When the casts are finished, the figures are trucked carefully to the studio machine shop, where their animation machinery is installed (page 203).

Dinosaur Will Go to World's Fair

I pointed to a sail-backed dinosaur which was being fitted into its skin and asked: "What will that one do?"

"It will be able to swish its tail from side to side, open its mouth, flex up and down like a lizard, and the sail will sway," Washo said matter-of-factly.

"Where will the dinosaurs and cave men be used?" I asked.

"They're for the Ford Motor exhibit at the 1964 World's Fair in New York," Bud said.

Plastic Birds Come to Life

One day after lunch, Walt grabbed my arm. "Come on," he said. "I want to show you something."

We walked in the bright sunshine between the stages on the movie studio lot and turned into the machine shop. Four elephants without skins sat in a row, gravely nodding their heads. On a bench lay what looked very much like a human hand, closing and opening silently. Farther down, a prehistoric man waved his arm; someone had incongruously placed a handkerchief in his hand.

On the machinists' benches stood a variety of plastic birds, opening and closing their beaks, turning their heads, and flipping their tails.

Walt stopped to talk to a machinist. I looked at one of the birds. Without its feathers, the creature was a mass of wiring and air tubes. As I watched, this unearthly bird puffed out its chest and began to sing.

A machinist told me that every bird contains five air lines and four sets of wires, plus a tiny loud-speaker.

"This is the latest thing we've done with Audio-Animatronics," Walt said. "We are using the new types of valves and controls developed for rockets. That way we can get extremely subtle motions."

"About that word," I said, "Audio-Animatronics."

"It's just animation with sound, run by electronics," he smiled. "Audio-Animatronics. It's an extension of animated drawings.

"We take an inanimate object and make it move. Everything is programmed on tape: the birds' movements, lighting effects, and sounds. We turn on the tape and the birds do their stuff. At the end, the tape automatically rewinds itself and starts all over again. With tape we could present a program of an hour and six minutes without repeating anything."

"Is anyone else doing this kind of thing?"

"I don't know anyone crazy enough," Walt laughed.

Mimie Mouse nuzzles a new friend at Disneyland, where employees costumed as Disney characters stroll the grounds. Official greeter Mickey Mouse may be the world's most photographed man. About half the visitors bring cameras, and he grants countless requests to pose.

Disney Birds Sing Popular Songs

Several weeks later, Walt invited me to the studio for a showing of the completed mock-up for the Enchanted Tiki Room, scheduled to open in the park this summer.

Now all the birds had been bedecked in colorful feathers, and were individually lighted. Four macaws opened the show with a line of chatter and then swung into a lively calypso number, followed by Offenbach's "Barcarole." A fountain jetted in time to the music under colored lights.

The fountain sent up a particularly high jet and, as it fell back into the bowl, a Bird-Mobile slowly descended from the ceiling, bearing yellow and white cockatoos. They broke loose with

"Buttering up" a cave man, technicians solder a shoulder to cover activating mechanism. The figure goes into the exhibit Disney is making for the Ford Motor Company's display at the New York World's Fair in 1964-65.

US EKTACHROME (ABOVE) AND KODACHROME © W.E.C.

Lifelike baby elephant, a plastic creation, rides off to enliven the Jungle Cruise. Voyagers will see it wiggling in the shallows and squirting water into the jaws of a crocodile. New totem poles will dress Frontierland's Indian Village.

"Let's All Sing Like the Birdies Sing," and brought down the house.

There was much more: songs sung by orchids and bird-of-paradise flowers; a rain storm; chants by tikis —carvings representing various native gods—accompanied by animated drummers. It is a tremendous show—the climax of more than two years' work at a cost of approximately a million dollars.

Abraham Lincoln Returns to Life

I went out into the street again with Walt and Wathel Rogers, who supervised the Enchanted Tiki Room. We entered another building and I got a shock; I almost bumped smack into Abraham Lincoln!

The illusion was alarming. The tall, lonely man sits in a chair much as in the Lincoln Memorial in Washington, D. C. But this is no cold stone figure; this Lincoln is man-size—and so realistic it seems made of flesh and blood (pages 206-07).

Wathel Rogers made adjustments at an electronic console, and Lincoln's eyes ranged the room. His tongue moved as if to moisten his lips and he cleared his throat. Then with a slight frown, he clasped the arms of his chair, stood up, and began to talk in measured tones.

"What constitutes the bulwark of our own liberty and independence?" he asked.

And then he answered: "Our reliance is in the love of liberty which God has planted in us. . . ."

To get an idea of the tremendous animation job this is, try it yourself. Sit in an armchair and pull yourself to your feet, observing how many muscles are called into play and the subtle balance required.

The Lincoln skin is the same Duraflex that has worked so well on the other Audio-Animatronic figures.

"Duraflex has a consistency much like human skin," Rogers said. "It flexes as well as compresses. Rubber, for example, will flex, but won't compress correctly for our needs."

Rogers described the mechanics: 16 air lines to the Lincoln head, 10 air lines to the hands and wrists, 14 hydraulic lines to control the

"*Buenos dias,*" chirps Jose the macaw as he greets audiences in the Enchanted Tiki Room, named for its carved images of Polynesian gods. Here, in a double exposure, Jose's head moves back and forth as he talks. He is one of 70 performing birds in this showcase for Audio-Animatronics.

Singing orchids harmonize with birds on golden perches. An artisan decorates a cage prior to the opening of the Tiki Room this summer. Visitors now see a 17-minute show with bird-and-flower versions of "Barcarole," "Let's All Sing Like the Birdies Sing," and "Hawaiian War Chant."

Exotic songster takes shape for the Tiki Room. Like the other birds, it has a plastic body but its feathers are real. Impulses from a tape recorder activate built-in air cylinders, here exposed, that create motion and sound.

Electronic Wizardry Produces a Lincoln Who Stands and Talks

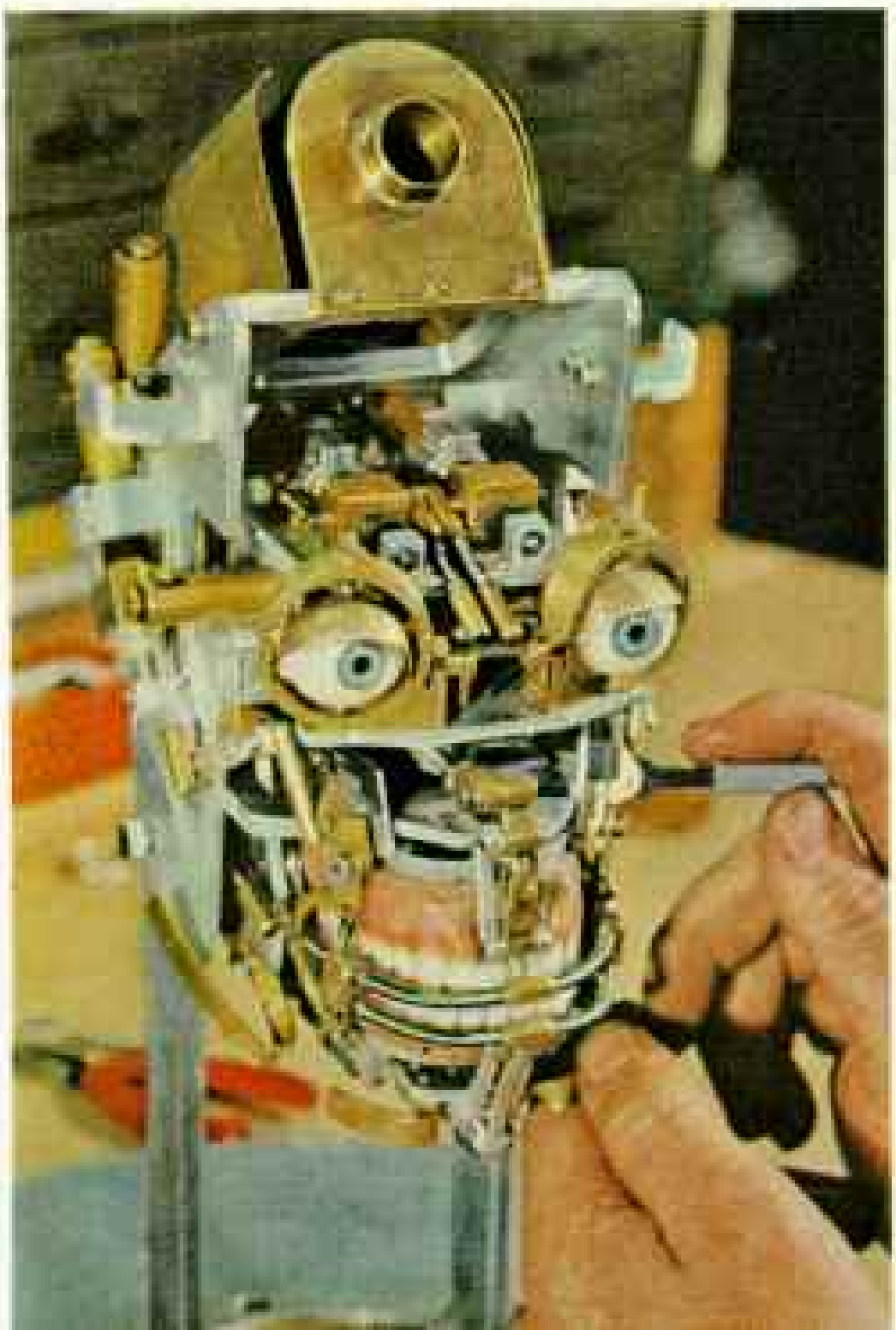
Battery of machines at left records on magnetic tape the voice and movements of the robot. Responding to the tape, an intricate system of pistons inside the plastic figure enables it to make 22 different motions.

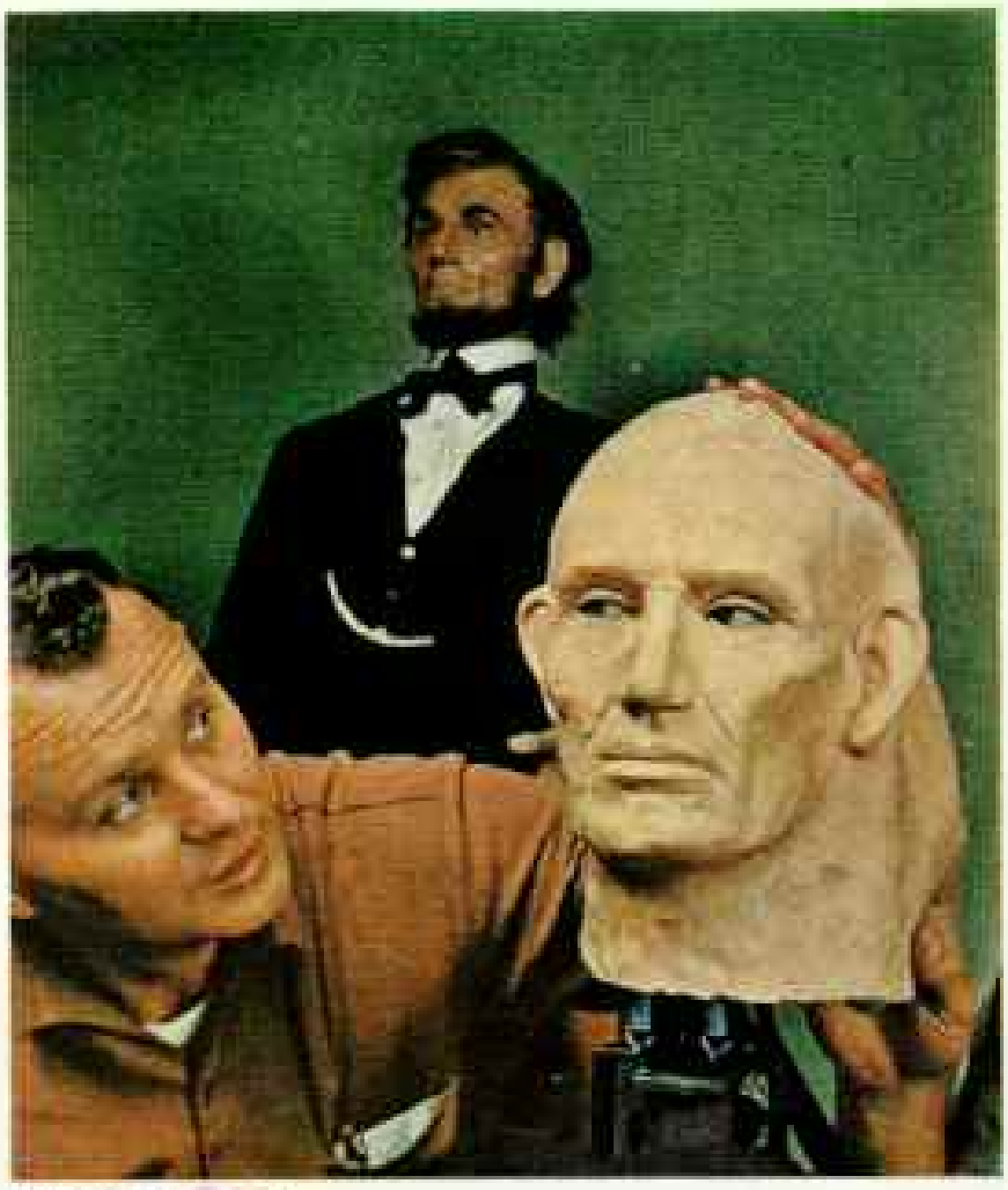
Disney engineers built the Lincoln image for the "One Nation Under God" exhibit, a future Disneyland attraction. In the Hall of Presidents it will sit among life-size statues of the 33 other Chief Executives. At the finale, the effigy will rise from a chair (opposite) and make a three-minute speech of famous excerpts from Lincoln's addresses.

Muscles of Steel Flex the Face of Lincoln

Large coil on the top of the head powers the jaw (lower left). After covering the head with a rigid plastic skull, a technician zips up the skin of flexible plastic (below). An artificial-eye maker supplied the plastic eyes, a wigmaker the human hair.

Mechanical Lincoln raises eyebrows and lifts the tongue while speaking (opposite, lower); the actions employ two of its 15 facial expressions. The figure's makers used Lincoln's life mask as their guide.





© NATIONAL GEOGRAPHIC SOCIETY

body, and two pairs of wires for every line.

Rogers ran the Lincoln face through some of its 15 expressions. Lincoln smiled at me (first on one side of his face, then the other). He raised each eyebrow quizzically, one at a time, then, fixing me with a glance, frowned and chilled my marrow. And just to show he wasn't really angry, he ended by giving me a genial wink.

"Lincoln is part of a Disneyland project called 'One Nation Under God,'" Wathel Rogers explained. "It will start with a Circarama presentation of great moments in constitutional crises.

"Circarama is a special motion-picture technique Walt developed for Disneyland and the Brussels World's Fair. The Bell Telephone Circarama now at Disneyland tells the story of the great sights of America. It has a 360-degree screen. The audience is surrounded by the continuous action, as if they were moving with the camera and able to see in all directions.

"The Circarama for the 'One Nation Under God' showing will have a 200-degree screen. After the Circarama showing, a curtain will close, then open again to reveal the Hall of Presidents. The visitor will see all the Chief Executives modeled life-size. He'll think it's a waxworks—until Lincoln stands up and begins to talk."

Audio-Animatronic figures are now being planned for Disneyland's French Quarter square in old New Orleans. They will also add chilling realism to the Haunted Mansion now under construction in Frontierland. (Visitors who ask about the mansion are told, "Walt's out capturing ghosts for it now.")

Never Do the Same Thing Twice

What next? Walt enjoys the past but he lives for the future.

"The fun is in always building something," he told me. "After it's built, you play with it a little and then you're through. You see, we never do the same thing twice around here. We're always opening up new doors."

I asked him a doleful question, "What happens when there is no more Walt Disney?"

"I think about that," he said. "Every day I'm throwing more responsibility to other men. Every day I'm trying to organize them more strongly.

"But I'll probably outlive them all," he grinned. "I'm 61. I've got everything I started out with except my tonsils, and that's above average. I plan to be around for a while."

THE END

THE *TECTONA* ROLLED quietly along with a nice favoring wind. The big Indian-built ketch, picturesque with her tanned sails and sturdy blue hull, turned the Channel waters white as she sailed through them, and they raced behind her in a broad wake. Nearby rose the tall tower of the Eddystone Light, with the sea washing fretfully at its base.

"Let's go in closer," said Tom Blackwell. "We can see the rocks."

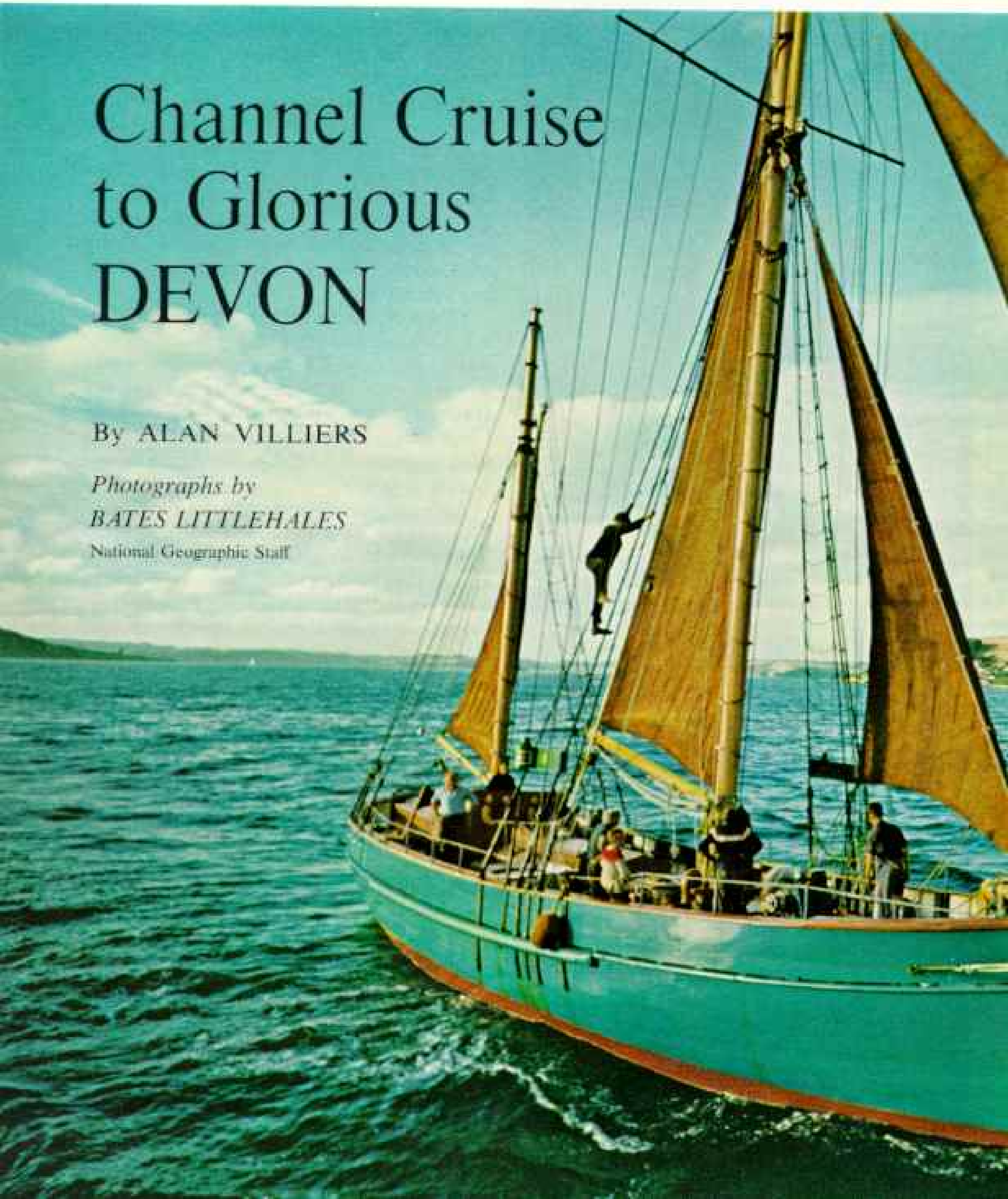
Tom, retired navy commander, owns the 83-ton ketch *Tectona*, then on the second leg of a wonderful Channel cruise that had already taken us from Cowes to Cornwall.* We had the same crew—Tom himself, sail

*See "Cowes to Cornwall," by Alan Villiers, NATIONAL GEOGRAPHIC, August, 1961.

Channel Cruise to Glorious DEVON

By ALAN VILLIERS

Photographs by
BATES LITTLEHALES
National Geographic Staff



veteran Ike Marsh; Peter Lisle-Taylor from Pangbourne Nautical College; Peter Villiers from the King's School, Canterbury; Nigel Glassborow, a Devonian from the edge of Dartmoor; Melville Bell Grosvenor, President-Editor of the National Geographic Society, and his son Edwin Stuart; and myself.

"The first lighthouse on Eddystone was built by a joker," said Ike.

"It doesn't look like a good place for jokes to me," piped up Edwin, at 8 our youngest ordinary seaman.

"He found that out," said Ike. "It drowned him."

Ike told the story. Henry Winstanley, a famous practical joker, inventor, and eccentric of the 17th century, lived in Essex. His home was like a fun fair, with trick chairs,

Tectona **lopes along** the English Channel under easy sail. Above, the author in foul-weather gear coxs the ketch as Ike Marsh steers.

mirrors, booby traps—everything but a Tunnel of Love. He installed a turnstile instead of a front gate and coined money from sightseers who flocked to see "Winstanley's Wonders," at a shilling a head.

The flow of shillings from this and other unusual enterprises enabled prankster Winstanley to become a shipowner. But the Eddystone Rocks wrecked two of his vessels, for the rocks were right in the fairway toward Plymouth's Sound.

"Why aren't they marked?" Winstanley demanded. He learned that the Crown had authorized a lighthouse but no architect would attempt the job.

"All right. I'll do it."

All Plymouth waited to see him fail.

"He did get his lighthouse built," Ike continued. "He began in 1696, and it took him a whole summer to secure a few big pilings in the rock. Waves washed over at every high tide. But he stuck to it. After three summers of work he had his 'mark' up—a bunch of candles burning in a lantern at the top of a queer-looking wooden tower on a stone base [page 212]. The light was feeble, but sailors could see it. The candle-lantern burned for five years, and during that time not one ship was lost.

"Winstanley was proud of his tower. He said it would stand the roughest storm and he'd be happy to stay there with it. He got his chance in 1703. Two weeks of gales delayed his periodic visit to the lighthouse to make repairs. Then there was a lull, and he went out to his tower.

"That night, while he was still at the light, a real ripsnorter of a storm blew up. In the morning nothing was left, and no sign of the joker or his tower was ever seen again."

"But he showed it could be done," said Eddie.

Indeed he did, and the present light, the fourth on the site, has stood there more than eighty years.

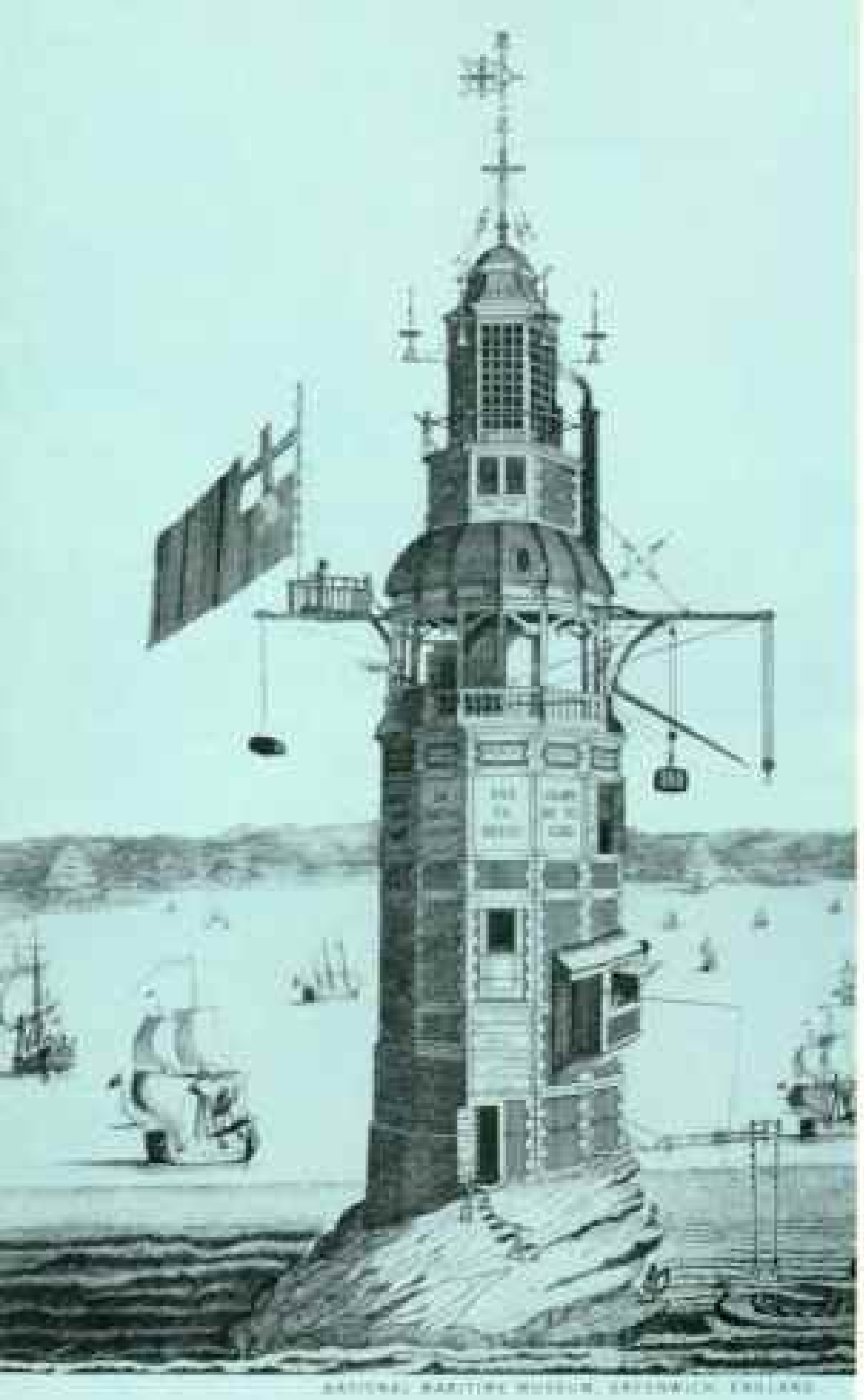
Doomed Armada Skirted Plymouth

As we ran on in past Rame Head toward the big breakwater, the sun came out and shone on the history-rich waters of The Sound. It was off here, one windy day in July, 1588, that the Spanish Armada sailed by.

We felt that we could almost see the glorious galleons, castellated, ablaze with banners and bright with gilt, their decks jammed with soldiers and the material of war in tremendous array. Some 125 vessels, 28 of them galleons, galleasses, and great ships, manned by 24,000 men, had lumbered past. Up-Channel they swept be-

Fish-hungry herring gulls ride the wind at Slapton Sands, where Americans trained for the Normandy invasion in World War II.

Two faces to the sea. Devon has spawned daring sailors since the days of Drake and Raleigh. Captain Villiers cruised its south coast by ketch, explored inland reaches by car.



NATIONAL MARITIME MUSEUM, GREENWICH, ENGLAND

First Eddystone Light Perches in Rickety Grandeur on Sea-carved Rocks

Ornate wind vane, numerous inscriptions, open galleries, and other flummadiddles bedeck the stone-and-wood tower that Henry Winstanley erected off the mouth of Plymouth harbor in 1698. The builder's own drawing shows him fishing from a balcony as hoists raise supplies.

A whimsical man, Winstanley boastfully wished to meet in his tower "the greatest storm that ever was." Fate granted his desire in November, 1703, when the most destructive gale in England's history wrecked some 150 ships and swept away lighthouse, crew, and Winstanley himself.

Eddystone's second light, of stone-weighted wood, creaked through Atlantic winds for 46 years; bad blows rocked the keepers out of their bunks. Then it burned. John Smeaton, first engineer to tackle the job, made the next tower of dovetailed stone blocks; and it stood steady for more than a century. When waves ate away its rock base, the top of Smeaton's lighthouse was removed to The Hoe (opposite). The present Eddystone Light was completed in 1882.

The first beacon in Smeaton's light came from 24 six-pound candles; electricity gives today's beam 730,000 candlepower. But Winstanley's feeble glow showed them the way.

fore a southwest wind—brave, magnificent, futile. They could have bottled up the English fleet in Plymouth, but missed the chance. Then a combination of English guns, storm, and sickness drove them on to defeat, leaving a trail of wrecks from the Channel around Scotland to the coasts of Ireland.

Away to windward of us great banks of summer clouds now piled the horizon like a thousand sails. Along that highway had passed the ships of history—the Venetian trading galleys on their annual voyages to change Asian spices and rich silks for English and Flanders woolens; the little *Mayflower* of 1620 with her Pilgrim Father band; Drake's *Golden Hind* heavy with riches seized from Spanish treasure ships 10,000 miles away; James Cook's old collier-bark *Endeavor* sailing off to seek a new Pacific continent. . . .

All had sailed this way from the cradle of the sea dogs, Devon.

Where *Mayflower* Sailed Into History

We swung around Drake's Island, checking off the well-marked channel by its buoys. "Down sail!" shouts Tom. Then, as the ketch slowly loses way, "Let go the anchor!" We fetch up, almost underneath The Hoe.

Plymouth citizens have always assembled at The Hoe whenever anything exciting occurred. I'd seen that Hoe black with people when the *Mayflower II* lay briefly at the destroyer buoys off Drake's Island before I sailed her for Plymouth, Massachusetts, in 1957.* I don't expect as many citizens crowded that same Hoe when the original sailed in 1620, for the brave Pilgrims attracted little notice. A *Mayflower* Stone stands on the old quay by the Barbican—the waterfront walk—to commemorate the event, but it was not put there until many years after the Pilgrims sailed.

On a perfect green by the side of The Hoe, a large group of elderly ladies and gentlemen were bowling, all dressed in immaculate white and not one of them less than 60. The ladies

*See, in the NATIONAL GEOGRAPHIC: "We're Coming Over on the *Mayflower*," May, 1957; and "How We Sailed the New *Mayflower* to America," November, 1957, both by Alan Villiers.

Built anew in a sweeping postwar reconstruction similar to Rotterdam's, Plymouth replaced narrow, winding streets with broad avenues, and medieval shops with modern buildings. Skyscraper is the Civic Building. Red-topped Smeaton Tower and the Naval War Memorial's obelisk stand above The Hoe, site of the city's most famous bowling green (page 214). Awning-striped swimming pool curves into The Sound.

Sailor's-eye view of Plymouth's Hoe, familiar to seafarers through the centuries, encompasses rugged cliffs. Rocks now hold a covered walkway and swimming pool (right).

Bowlers "throw woods" on The Hoe, where Sir Francis Drake played out a famous game on a July day in 1588. Told the Spanish Armada was approaching, he calmly finished his match before sailing out to fight. These teams play by rules little changed from Drake's time; the unevenly weighted ball, rolling in a curve, jockeys for position nearest a smaller ball. Group in club colors at right bowls behind Drake's statue.

Dividers in hand, a bronze Drake measures the globe he was the first Englishman to circle. Returning in 1580, he became mayor of Plymouth.

bent and stretched their nylons while skillfully rolling the black ball along the turf, flat as the top of a billiard table (opposite).

"Well done, Charlie! Well done, Veronica!" They shouted genteel encouragement for some well-placed bowl while a crowd of Charlies and Veronicas had fun, with never a backward glance at The Sound. The statue of that most illustrious of bowlers, Sir Francis Drake, stands nearby, looking out to sea (left).

Sir Francis Decides Armada Can Wait

Here at The Hoe, a favorite story goes, the stout Sir Francis was busy at his game of bowls as the Armada approached. Finding the English admirals on the green, the captain of a scouting ship shouted, "The Spaniards are coming!"

"Let them wait their turn," is the gist of Drake's reply. "There's time for this and to beat the Spaniard afterwards."

So saying, he bent again to the game.

"But," scoffed Eddie, "I don't believe an admiral would go on playing when an enemy fleet was coming in."

I'd thought the same myself; so I called at Plymouth's rebuilt Public Library, where a large collection is devoted to Plymouth and Devon history.

"Yes, we accept the story," City Librarian W. Best Harris told me. "After all, it is a nearly contemporary account, believed by those living at the time. We have no record of any of them doubting it."

"But play bowls when he could be caught in his harbor?" I remembered Drake's reputation as a fiery, impulsive leader. "How does that make sense?"

"Well, in the first place, the game was very popular," Mr. Harris replied. "Indeed, the Queen had forbidden it, because the game was so much played she feared it would stop her men from practicing archery. But London was a long way from Devon then.

"The real point, though, is this: When Drake stooped to those bowls again, he *knew* he had time to finish his game. He'd seen one of his scouting pinnaces race in and guessed what news she brought. He had already given orders to muster everyone aboard the English ships and to warp them out of the Cattewater, Sutton Harbour, and The Sound with all speed. There was little a commander could do until the ships were clear of their berths and the tide had turned in their favor. It would take hours to get the fleet under way —plenty of time to finish the game."

Sir Francis had been in tight corners be-

OLD-TIME POMP *abides in a new setting as Queen Elizabeth II inspects the heart of rebuilt Plymouth. Silver-gilt maces symbolize the authority of the red-robed Lord Mayor. Here on Armada Way mace-bearers parade them upside down to show submission to the Sovereign. Prince Philip, following the Queen, is Plymouth's Lord High Steward.*

fore; none knew better the value of a cool demeanor in the face of the enemy, no matter how powerful. So out he came, beat up behind the Spaniards, and in due course he and the others drove them up the Channel to defeat and oblivion.

Drake's Leat Still Serves Plymouth

The odd thing is that Plymouth folk remember their fellow citizen not for his contribution to the defeat of the Spanish Armada or his circumnavigation with the *Golden Hind*, but as the contractor who brought fresh water into town.

I called on City Water Engineer Mr. N. G. Elliot in his office on Portland Square, to find out about it.

"Oh, Drake's Leat," he said. "How would you like a piece of it? We're disposing of it."

The city was relinquishing title to the land along the "leat," or watercourse. Near the source of Drake's channel the city had built a reservoir, from which modern mains now bring in a constant supply of soft, fresh water.

"We use some parts of the old leat for surface drainage even today," said the water engineer. "You can still see part of it beside the Sherwell Congregational Church on the Tavistock Road."

Sure enough, there was the old watercourse, its sides cemented now and some leafy bowers growing over it, but still the same seven-foot width and three-foot depth Drake's men had cut in the 1590's.

Drake's Leat still hits the headlines. A few years ago, some houses were mysteriously flooded. It appeared that a cinema had been built over a section of the channel. Some ushers, finding a convenient crack in the floor, had dropped torn-up tickets through this crack for years, never realizing they were creating a hidden dam. Heavy rains plus this dam of tickets led to the flood.

New and Gleaming City Rises

Every visitor to Plymouth is astonished at the reconstruction program which the city, gutted by the bombing raids of World War II, has been carrying on. At the end of the war, Plymouth's civic and commercial centers were flattened, tens of thousands of its 220,000 citizens were homeless and gone (a good many forever), and hardly a street, lane, or back alley anywhere remained unscarred.

I'd been in some of those bombing raids myself, when I was in the navy. We used to kick the incendiary bombs straight overboard from our moored ship into the water

Friendly encounter: A Dartmoor pony begs for food, but law forbids the motorist to give it. Such ponies wander wild amid the beautiful desolation of the moor.

Prancing in evening gold, a frisky foal gives life to a shimmering vision of Dartmoor. The shot won a first prize for NATIONAL GEOGRAPHIC photographer Bates Littlehales in the 20th annual Pictures of the Year Competition. Like Dr. Watson in Sir Arthur Conan Doyle's *The Hound of the Baskervilles*, the photographer's camera "saw beyond the trees a broken fringe of rocks, and the long . . . curve of the melancholy moor."

where they couldn't do any harm. But people ashore couldn't do that. Whole streets were flattened; the very roadways disappeared. Plymouth was one of the most thoroughly destroyed cities in all Britain.

With great courage the city fathers decided not just to replace what had been, but to build the most modern city in England's southwest.

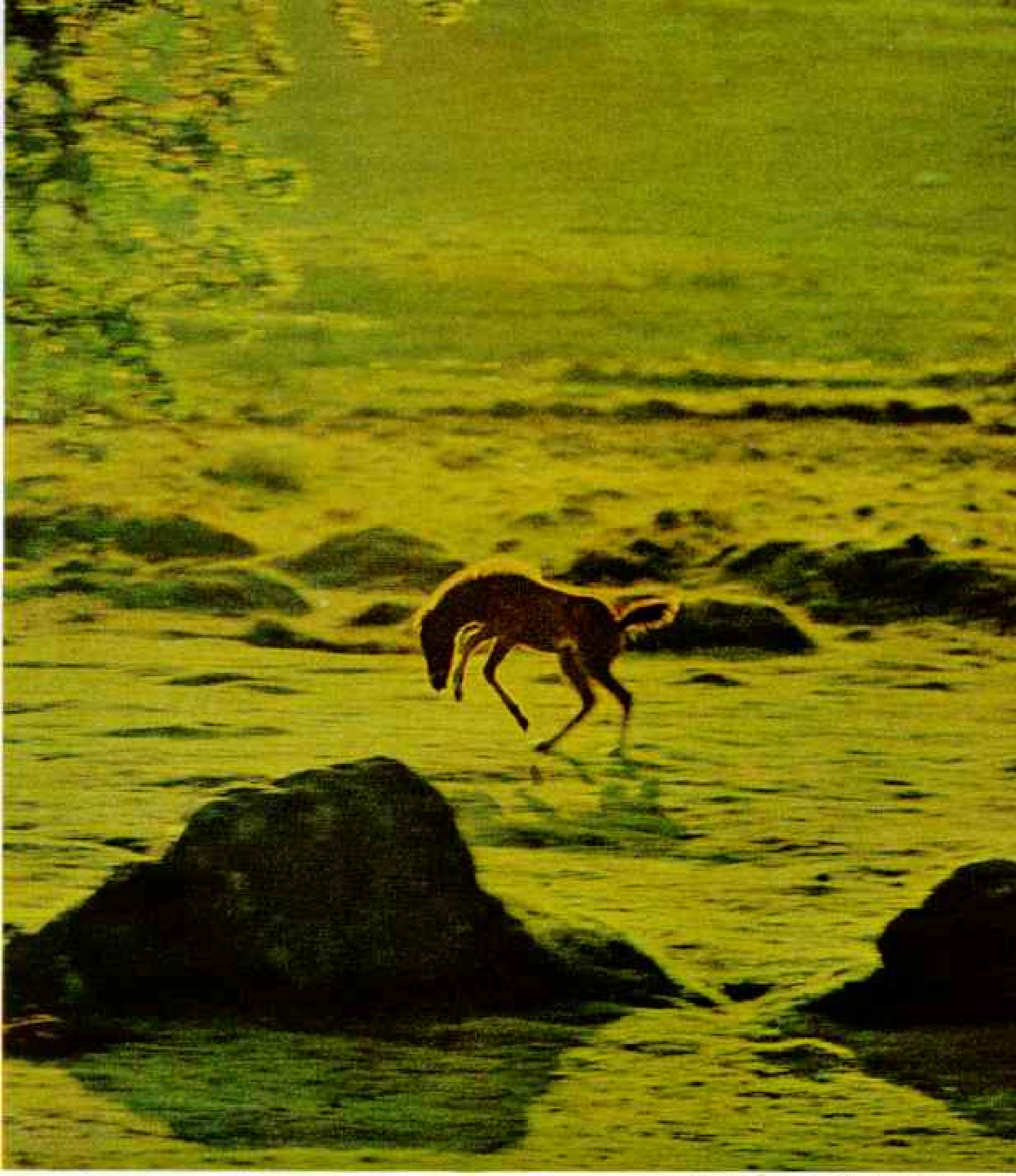
This they have now done.

"The first major stage was completed when Her Majesty the Queen formally opened the Civic Building," Town Clerk S. Lloyd Jones told me. He added that he did not know of a city of comparable size in all Europe that had been so thorough in its reconstruction.

City's Dream Not Yet Completed

"Buildings the war had spared we tore down, in order to do the job properly," he explained. "We had to resite a number of businesses. The next stage, which may last as long as twenty years, is to provide adequate roads around the center, and to build a new hospital and a new university."

As we looked down the fine sweep of Armada Way, we saw new department stores, shops, banks, and public buildings that rose from a right-angled layout of wide, garden-filled streets. The 15-story concrete and steel Civic Building marked a new and exciting city center. Big red buses moved swiftly through a flow of fast traffic which never



seemed to jam. Thoughtful planners have so laid out the stores and arcades that, when it rains, the citizens can shop through a whole square without coming into the open.

In all this modernization the past has not been overlooked. Along the Barbican, beside the Elizabethan port at Sutton Harbour, whence Grenville, Frobisher, Hawkins, Raleigh, Drake, and the Pilgrim Fathers sailed, some ancient buildings have been restored. Among them is Island House. Tradition holds that this is where the Pilgrim Fathers stayed during their last days in England in 1620.

Plymouth is an ideal gateway to many-faceted, beautiful Devon, England's third largest county in area after Yorkshire and Lincolnshire. Eastward, up-Channel, stretches a host of lovely ports, quiet, safe, and peaceful (map, page 211). We would be sailing into them in due course, but we had no intention

of bashing *Tectona* back around Land's End to cruise along Devon's very different wild north coast.

"No go," said Tom Blackwell. "Apart from Bideford and Ilfracombe the ports are few and far between. Just miles and miles of rocky lee shore."

So, leaving *Tectona* safely berthed in Mill Bay docks just west of The Hoe, we set out to explore Devon's picturesque lanes and byways by car. I learned later, however, that there are two better ways to use those famous lanes—at least in the press of summer traffic. One is to patronize the big buses and motor coaches, the other to walk. The double-decker buses offer wonderful views over hedgerows and fields, but they take their time.

Every lane seemed to thin out on the hills—the steeper the hill, the narrower the lane. This was natural, after all, for those lanes were developed to take a man and a horse, or at most a one-horse dray. A horse may plant his big feet in the side of a hedge, but the automobile is a different matter, especially a nice new hired one.

Those Devon lanes sink low, where the rains of centuries and the ironshod wheels of a thousand drays have worn away the roadbed. Frequently granite stones, taken from the field years ago, form the bases of these

Ablaze with blossoms, snug cottages near Dartmouth catch the eye of *Tectona*'s bosun, Ike Marsh, as he strolls a rain-washed lane. Charm of such thatched homes in a tranquil setting attracts many Britons now retired from service in distant outposts.

ALAN VILLIERS (BELOW) AND ROBERT S. OSBORN © NATIONAL GEOGRAPHIC SOCIETY

Pace of yesterday: Horse-drawn coach carries travelers along a Devon lane near Chagford in 1920. A coach dog trots obediently behind.

A. W. Cutler, one of the first photographers sent abroad by the GEOGRAPHIC, took the picture; he later died on assignment in Italy.

Tempo of today: Venerable sports car darts down a paved lane walled by hedgerows. Many of Devon's roads are so narrow that cars cannot pass. Then, usually in high good humor, one driver will back up until he finds a place to pull off.

PAINTINGS BY BATEN LITTLEDALES (ABOVE) AND MELVILLE BELL GROSVENOR © N.G.S.

"**A village like a waterfall,**" a poet has written of Clovelly, whose main street tumbles down a cliffside to the sea. Charles Kingsley, who had lived here as a lad, returned and wrote: "Contrary to one's usual experience in visiting old scenes, the hills are higher, the vegetation more luxurious, the colouring richer than I had fancied." Medieval charm of shops and cottages, carefully preserved by the owners, delights streams of visitors.

Stone archway of the Red Lion Hotel frames Clovelly's waterfront where children ride donkeys along the quay. Charles Dickens described the "red-brown cliffs, richly wooded to their extremest verge."

Kingsley once said to his wife: "Now that you have seen Clovelly, you know what was the inspiration of my life before I met you."

Beamy motorboats, resting on the beach at low tide, replace old-time fishing luggers in Clovelly's anchorage. In summer, roomy craft such as *Saucy Lass* abandon their fishing jobs to take visitors round Barnstaple Bay. Boys go about boys' business.


SAUCY LASS

hedges. Set solidly there, they once marked field boundaries. Now, sunken, they serve to hold the field edge in place. Hawthorn, ferns, blackberries—ripe and lush and wonderfully tasty—all sorts of vegetation flourishes, often over car-top height.

"Three inches on this side," Mel Grosvenor called out to the driver as, for the tenth time on a typical morning, we backed cautiously down a steep gradient to a passing place about five yards wide, to allow a small car to squeeze by.

Cars Must Yield to Cows

Three inches! Soon it was nothing. Prickly blackberry stalks brush the car. Just as we approach the small widening that serves as a passing place, a herd of large red cows comes calmly round the corner, big-uddered, orderly, unconcerned. It's their road and they know it. We just have to stop until they plod by, one at a time. Such are the frustrations—the charm—of Devon's lovely, winding lanes.

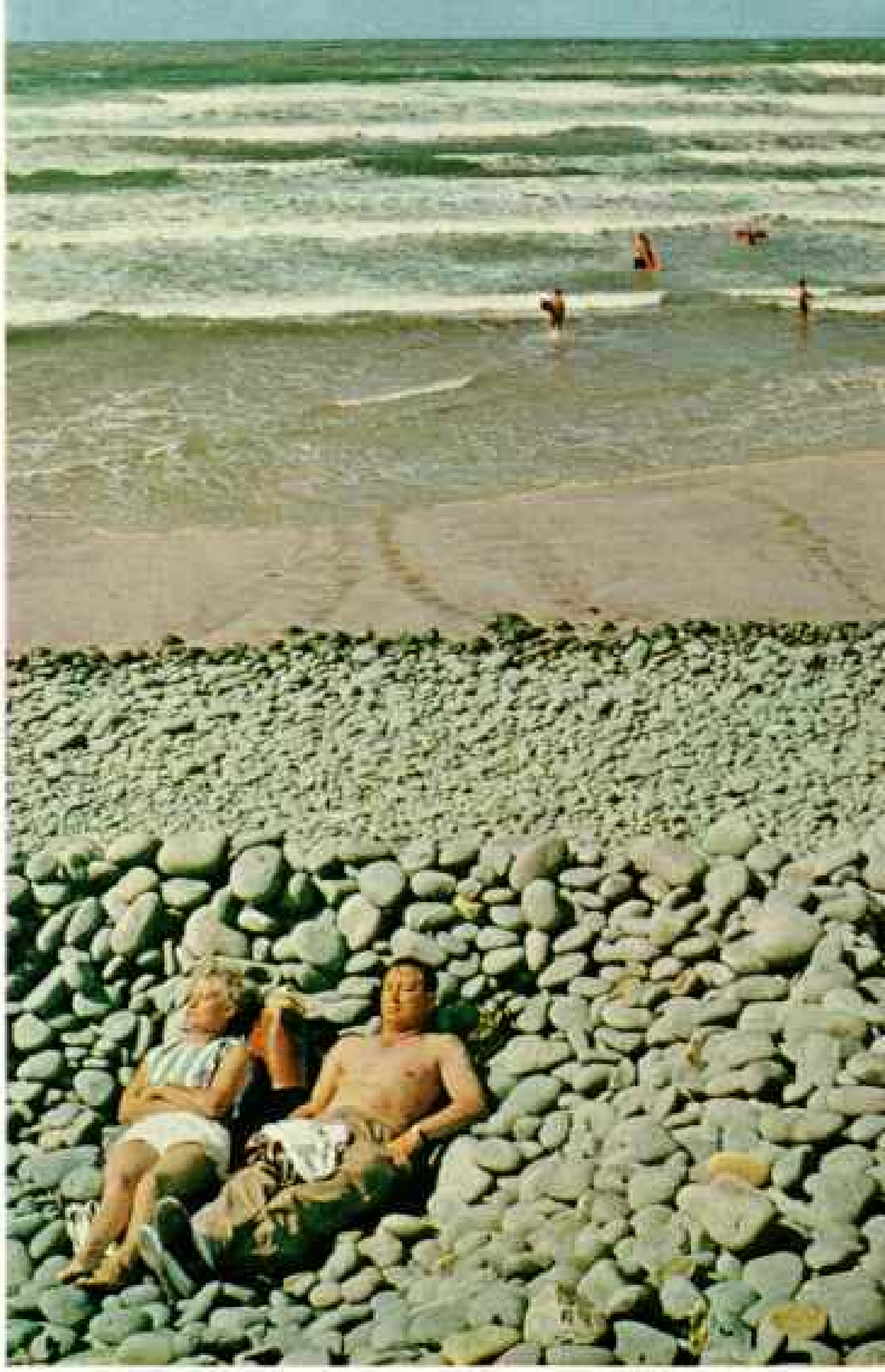
Just out from Plymouth lies Dartmoor, with its dramatic scenery, its famous ponies, and its somber prison built to house prisoners of the Napoleonic Wars. From that dread structure successfulescape across the sinister, windswept, and often mist-shrouded moor is almost unknown.

Beyond, across Dartmoor, lies the fascinating north, with beauty spots like Clovelly, Westward Ho! of literary fame, Lynton and Lynmouth, Water's Meet, Ilfracombe. Back of Dartmoor, to the northeast, is Exmoor.

To see all this, I set off with an old wartime shipmate, Comdr. V. Judge Glassborow, O.B.E., and his wife Gwen, who now live at Yelverton by the edge of Dartmoor.

"The commoners who farm the fringes of Dartmoor or patches of land on the moor itself have rights to graze stock, cut peat, and remove a certain quantity of stone," the commander said. "It's been that way for hundreds of years."

Suddenly the well-tilled fields dropped behind. All around instead was open ground, hilly, rolling away for miles. We rattled over a cattle grid set in the roadway.



Lumpy cobbles of a natural wall shelter sun bathers at a seaside community named Westward Ho! for Kingsley's book. Swimmers test breakers that sometimes bring in relics

"That grid is to stop the stock from straying into and out of the moor and to keep the ponies in," my friend said.

We saw a knot of the famous Dartmoor ponies, sturdy little fellows with their rough coats (page 218). They looked friendly and docile. Two or three raised shaggy heads.

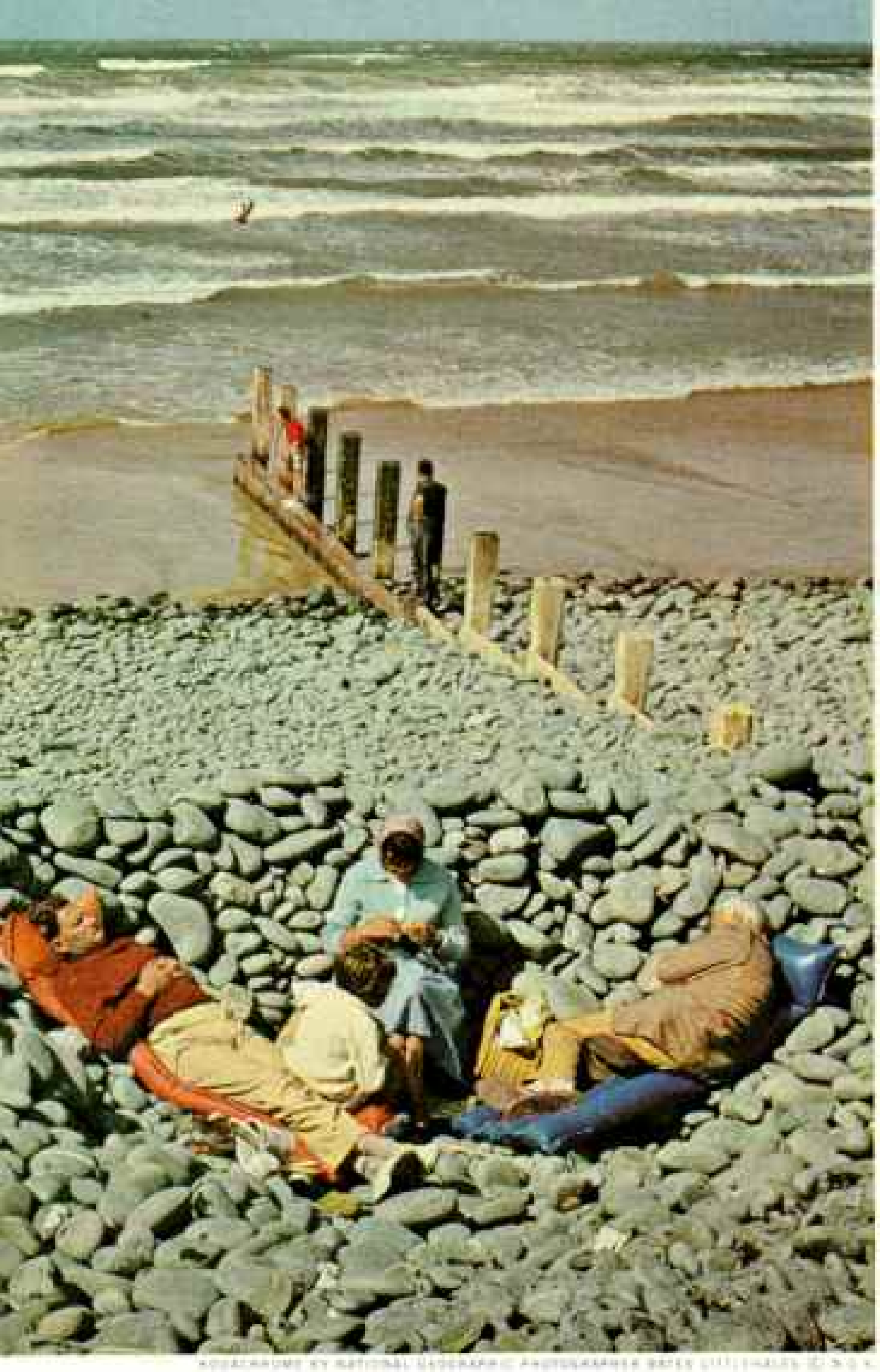
No Handouts for the Ponies

I reached for some crusts to throw them.

"Don't feed those ponies. It's against the law!"

I pulled the crusts back quickly.

"A lot of tourists stop their cars and feed the ponies," Gwen Glassborow explained. "Then the poor little things crowd onto the roads. And there are some nasty accidents."



from a submerged forest—antlers and Neolithic flint arrowheads. Rocks from the Old World rode to the New as ballast in sailing ships; some wound up paving American streets.

The ponies used to be wild, I gathered, but now carry the brands of farmers with moor rights. They still graze completely free, except for an annual roundup.

Sales are held at Ashburton, Chagford, Okehampton, and Tavistock. The moor ponies used to be in demand for the coal mines, where they hauled trucks underground. Now they are favorites with children. The surefooted little animals also serve as local hunters and as farmers' hacks. They are sold unbroken, mostly to dealers.

"As late as 1940 you could get one for about a dollar. But not now," my friends told me.

We passed a local farmer outside Tavistock, going along on his pony with a couple of cattle dogs trotting at his heels. The farmer was dressed in an old suit, the trousers stuffed into rubber sea boots, an old felt hat jammed on his head.

It began to rain as we followed the tortuous road across the vast and eerie moor. Not a tree was in sight. Granite outcrops sprang rough and defiant from the furze and heather and peaty bogs.

The rain lashed up by the sudden southwest gales flung itself upon moor and hill, as if determined to spread the bog, stifle the heather, and drive out humans, ponies, and cattle forever.

Mists Help Guard Prison

So it had been driving there for countless thousand years, with the wild gales shrieking. In the mist and rain the moor looks old, hostile, frightening. There are 365 square miles of it, and it's a high land—parts of it lie above 2,000 feet. Many have lost their way on that moor, and many have disappeared forever in its fastness.

"That's one reason why the prison was put there," I remembered the Plymouth city librarian had said. "Escape is almost impossible. Nobody can keep his bearings in a mist on Dartmoor."

"It's an extraordinary place," Gwen said. "We live here, and we know it can be beautiful. But it can be eerie, too—menacing, oddly mysterious.

"Even the animals seem afraid of it sometimes. You hear the ponies whinny, see them trembling, and the dogs' hair bristles. Yet you see nothing—only feel."

Unfarmed and untamable, Dartmoor stands secure and dreadful in its loneliness. Yet the moor has its value. Some years its rainfall exceeds a hundred inches, four times the national average. Surplus water from innumerable bogs and hummocks of wet peat washes away in a dozen streams and rivers to water the fertile fields of Devon.

Villages with pretty names like Mary Tavy flourish by Dartmoor's fertile borders, where prehistoric man once lived. Stone cairns and the remains of Bronze Age huts dot the moor.

Remains of ancient cremated bones have been found inside *kistvaens*—boxlike graves made of stone slabs—on Dartmoor. A stone coffin

Cloth-capped laborer in Ashburton holds his daughter, a Brownie, with proud hands.

Chimneysweep takes his ease on a Dartmouth street—soot, brushes, and all.

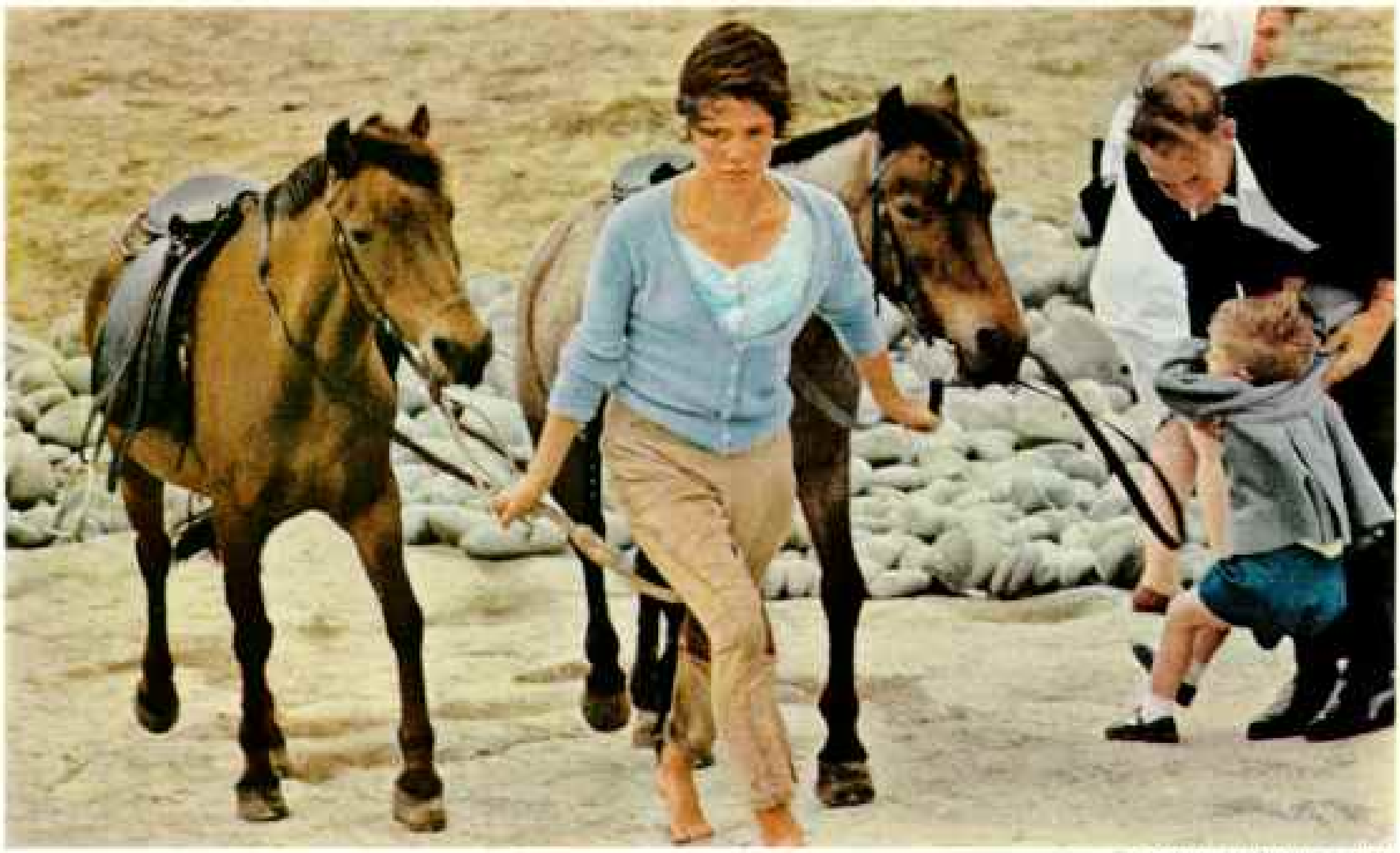
Salcombe beauty works for her father in the Fortescue, an inn named after a Royalist who briefly held Salcombe Castle against Parliamentary forces during Britain's Civil War.

Devon: sturdy men and winsome women

ALL PAINTINGS BY ROBERT H. GOODMAN (UPPER RIGHT) AND ANITA LITTLEFIELD © N.G.S.

Pipe fuming smoke, artist Laurie George paints fishing boats at Brixham. William of Orange landed here in 1688 on his way to depose his father-in-law, James II. Brixham ways launched *Mayflower II*, which the author sailed across the Atlantic to New England in 1957.

ALL PAINTINGS BY ROBERT H. GOODMAN



Ponies and people evacuate the beach in the face of a rising wind at Westward Ho! Waves sometimes toss cobbles inland; during one week each year, potwallopers (home owners, so called because they boil, or wallop, pots over their own fires) throw the stones back onto the beach.

"Sing unto the Lord" forms a command to these Salvation Army workers in Babbacombe, a resort town on Devon's south coast near Torquay.

Blazered schoolboy at Totnes lounges in the spirit of Brutus, mythical invader from Troy, who said, "Here I am and here I rest, And this town shall be called Totnes."

Like a lonely gull, a sloop skims waters once white with the sails of ketches, brigantines, and schooners built in Appledore yards. The village on the Taw and Torridge estuary now flourishes as a yachting center. Low tide leaves boats high and dry.

opened on Lundy Island (which also is part of Devon) contained the skeleton of a man more than eight feet tall.

Men have been living in Dartmoor a long, long time. In such a wild and remote retreat, enemies stood little chance against those with local knowledge. Ancient Celts built hill forts around its fringes.

Tin was once worked on Dartmoor, but none is panned from streams or mined today. Now the waterways are a paradise for fishermen. I saw scarcely a brook without anglers hopefully casting flies for salmon and trout. In rain or gray mist or colorful sunshine, they are lost in their thoughts, oblivious to ghosts of Bronze Age men or tough tin miners.

Beyond the moor, quickly the villages appeared again, and the pretty homes with gardens so full of flowers that one wondered how so many glorious blooms could flourish in so small a space.

We stopped at an old thatched inn, the George at Hatherleigh. The house is believed to have originated in the 10th century as a humble dwelling of monks; later it became a chapel.

In a dining room beamed with oak blackened by centuries of smoke from enormous open fireplaces, we regaled ourselves with roast beef and beer sauce.

Broken Kingpin Proves Profitable

The talk turned to the old days of travel by stagecoach; a villager had some stories to contribute.

"Those old coachmen were colorful characters," he observed.

One driver, he said, pretended to find a broken kingpin underneath his coach every time he had a load of strangers. A defective kingpin could wreck the coach, and they all knew it. So the passengers would have a whip-around of half crowns for the coachman. His kingpin was perfectly all right, of course. He kept a bad one in his big coat pocket for use on appropriate occasions.

"The same old rascal used a ruse to lighten his coach before going up steep hills. He'd just say loudly what a wonderful thing it would be if all the *young* women would get down and walk, to help the poor 'osses. Every woman aboard unfailingly got off."

I almost expected to hear the rattle and bustle of a coach come rushing in, horns blowing, iron-shod hoofs striking the cobbled roadway as the villager talked.

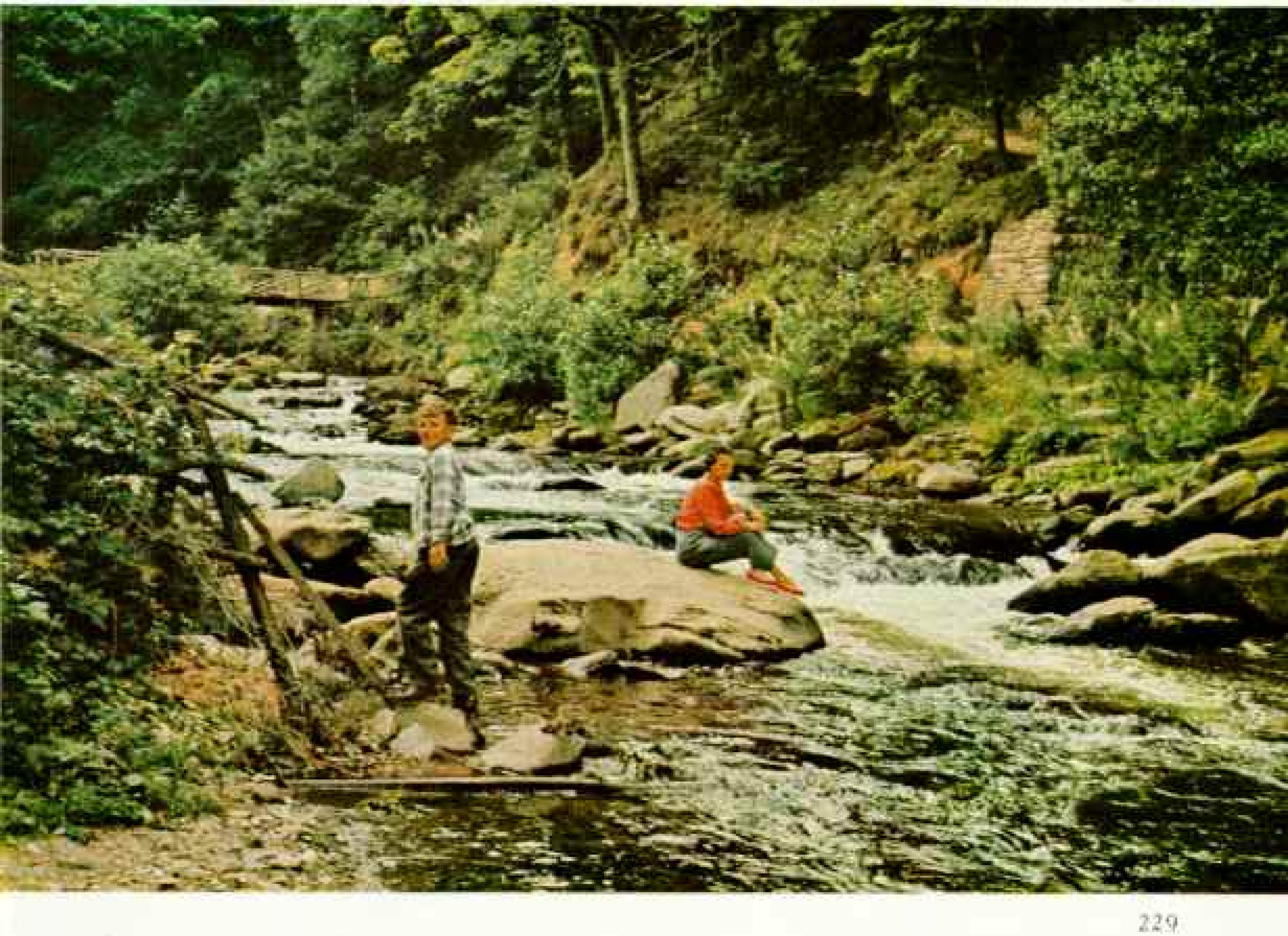
Coaching isn't forgotten in parts of Devon, even now. As recently as 1929 horse-drawn coaches took visitors on tours in Dartmoor (page 221).

Once away from Hatherleigh, it was a pleasant trip to Clovelly, the seaside village that every visitor knows.

Here Charles Kingsley once lived when his father was rector of the church on the hill. The picturesque harbor, its pier containing stones 600 years old, and the heavy iron cannon up-ended and sunk into it for mooring posts, may have inspired in him some ideas for his wonderful stories.

Clovelly clings to the side of a north Devon cliff, and its one main street is so steep that no

Frothing over the rocks, Hoaroak Water mingles here at Water's Meet with the East Lyn River, and a single stream, black from peat, races down-mountain to the sea. England's Romantic poets loved this wild region. One visitor, Robert Southey, viewed a similar stream's heedless plunge and wrote that it went "dashing and flashing and splashing and clashing."



wheeled vehicle can use it (page 222). Deliveries are made by boy-drawn sleds, sliding down the smooth cobbles. Land Rovers, following a back way that keeps them out of sight, carry weary travelers up from the harbor.

The village is best seen by evening and by dawn when the day's rush of visitors is not there. By morning light, we took a run along the oddly named Hobby Drive, a toll road that skirts the clifftops east of Clovelly. A pretty young woman carrying a baby in her arms opened the gate for us, and the charge was three shillings—42 cents.

"It is only fourpence if you like to walk," she said.

Driving along the rough road, we looked down upon the perfect setting of Clovelly's harbor and farther along had glorious views of the Devon coast as far away as Westward

Channel of destruction: In 1952 floodwaters in the gorge at right hurled down boulders and trees, devastating low-lying Lynmouth, onetime home of the poet Shelley. The hotel high on the cliff escaped. Wooded slopes belong to the National Trust.

On a walking tour through this countryside, Wordsworth and Coleridge planned *The Rime of the Ancient Mariner.*

Beacon fires once blazed atop Lynmouth's tower, guiding mariners into the harbor. Here at low tide the boat basin lies nearly drained; high tide surges to ramp-top.

Ho! and over the Bristol Channel toward Lundy Island.

All along the beach at Westward Ho! the rollers came thundering in (page 224). The curiously named village will be forever linked with the novel by Charles Kingsley and with Rudyard Kipling, who was at school there.

U. S. Sister City Differs on Spelling

The famous fall fair was in full swing at Barnstaple when we arrived. The festive event, say the Barnstaple people, dates back to the time of the Saxon King Athelstan.

Barnstaple claims to be the oldest borough in all England. Saxons and Normans left their mark; Shakespeare, according to legend, came to it with his Players. Samuel Pepys found himself a wife among some Huguenots who settled there. The borough celebrated its 1,000th birthday in 1930.

While I watched in narrow High Street by the Guildhall, the Mayor of Barnstaple came by in procession with his mace-bearer, beadles, and other officials, all in their picturesque robes of office.

"We are invited to make a visit to our sister city in the U. S. A.," the Mayor told me as he and his wife sampled the games and amusements of the fair. "That's Barnstable, in Massachusetts. Now, I wonder where they got their 'b' from?"

"I expect," I said, "that somebody just misspelled it." After all, consistency in spelling is a very modern idea.

Both Barnstaple and neighboring Bideford are proud of their beautiful old arched bridges. There was some agitation to widen them, especially at Barnstaple.

"What, spoil our bridge just to bring in more cars more quickly, to knock more of us down?" the beadle remarked to me. "Not likely! Build a new bridge—why, we might do that. But spoil the old one, never."

But since my visit, I have learned that widening is under way.

Charles Kingsley often walked over Bide-

ford's old bridge and watched the swift waters below flow "toward the broad surges of the bar, and the everlasting thunder of the long Atlantic swell." A statue of him stands at its approaches, with pen and book in hand.

Over that swell rode the illustrious Sir Richard Grenville, the Elizabethan who gave battle to a Spanish fleet by himself on a famous occasion once, off the Azores:

At Flores in the Azores Sir Richard Grenville lay,
And a pinnace, like a fluttered bird, came flying from far away:
"Spanish ships of war at sea! we have sighted fifty-three!"

The year was 1591, and Sir Richard was vice admiral of an English squadron surprised by a larger Spanish force. The other English ships ran, but Sir Richard, commanding "Men of Bideford in Devon," elected to fight—a fatal decision.

I had learned the Tennyson poem as a schoolboy in Melbourne, thousands of miles away, and had little idea of where Bideford was. Now I dropped in at St. Mary's Church, where the Grenville arms are still on the old bench ends, and a plaque bears the words attributed to Sir Richard before he died:

"Here die I, Richard Grenville, with a joyful and quiet mind, for that I have ended my life as a true soldier ought to do. . . ."

It was also from Bideford, in 1586, that Grenville had sailed with supplies for a colony founded the year before in Virginia. Unknown to Grenville, the colonists had returned to England aboard a ship captained by Drake. Finding no settlers, Grenville left 15 men to secure England's claim upon the vast new land. A later party found the bones of one, but the fate of the others remains a mystery.

Hedges Warded Off Stags

By double-decker bus, I once more threaded my way through Devon's delightful lanes, peering above the tall hedges that lined the narrow roadways. I had been told how farmers of olden times had relied on that thick growth—far too high for leaping—to protect their fields from marauding stags. Centuries ago, the forest laws, which allowed stags to roam at will, applied to most English lands. A stag could eat a farmer's crops, but the farmer who killed such a raider was guilty of poaching. In early times this crime could be punished by death.

Stags no longer roam Dartmoor, but there are plenty of red deer on Exmoor, not far from Ilfracombe. This North Devon port, which figures in the Domesday Book, is now an important tourist center.

Another port—an extremely small one, open only at high tide—is Lynmouth, a fascinating place where the steep, tumbling Lyn Rivers meet the sea. On the stone breakwater perches an old tower, crowned with an iron brazier to hold fire as a beacon; its importance nowadays, though, is chiefly historical (page 230).

The name Lyn is well taken; it is thought to be from the Anglo-Saxon *lynna*, meaning torrent. I talked to some boatmen about the terrible flood of 1952 which swept suddenly down on Lynmouth on a summer night. Two weeks of rain had soaked the ground, the boatmen told me, so that the big bog lakes

Balancing on a tine-anchored tool, a thatcher near Widecombe in the Moor tops a roof with fresh straw. A good straw roof—14 to 18 inches thick—will last up to 25 years.

on Exmoor could not store the rains that burst out of a freak cloud that night.

So the water all came down at once, roaring through the chasms in the hills which are the beds of the East and West Lyn Rivers. The water swept like a mad and unpredicted tidal bore, bringing with it trees that knocked down cottages, undermining banks in the village, and carrying away houses.

"The poor little town hadn't a chance," said one of the boatmen. "It was night and the place was full of visitors. Forty-three people died."

New flood-control measures should prevent any more such tragedies.

By automobile, I proceeded inland along a winding road beside the East Lyn to poetically named Water's Meet. Here Hoar-oak Water meets the East Lyn at a shaded, wooded junction (page 229). In freshet the waters smash over rocks, throwing fine clouds of spray and spume halfway up the tall trees.

The peaty water swished like churning ale below the little wooden bridges spanning the streams. High up, a temporary opening in the racing clouds allowed the sun to shine through briefly, lining the water with silver, turning the upflung spray to a cloud of sunbeams. But I would hate to be trapped there in flood.

Flowers Bloom in December

Lynmouth is a place the poet Shelley loved. I returned there on a winter's day when the little port was deserted and the seas of Bristol Channel raced furiously, breaking violently on the bar close offshore and curling white like snarling dogs along the cliffs.

Devon "rubies," sleek red cattle, graze heather-laced pastures near Exmoor; their rich milk yields the famous Devonshire cream. Hedgerows once kept out the king's deer; a fence so concealed this view from the road that the photographer had to shoot from atop his car. The Doone family of R. D. Blackmore's *Lorna Doone* raided these lands. 233

Regimental reunion at Exeter draws men of the Devonshire-Dorset unit. Here bandmasters exchange reminiscences. The one at right wears medals from the Boer and First World Wars.

Painted stone effigy of Lady Dorothy Dodderidge reposes stiffly on her 17th-century tomb in Exeter Cathedral. Carver used skull to symbolize death.

Even in December the fuchsia can be found in full bloom and there are rambling roses in the gardens. The beach looked appalling at low tide—a litter of dark rocks washed down from the valley and cliffs for centuries. Many houses and hotels were shut, but the day was bright and clear despite the gale. Across the Bristol Channel I could see, miles away, the blue mountains of Wales.

I pictured the young Shelley there, sent down from University College at Oxford in disgrace, penning revolutionary pamphlets and flinging them in bottles into the sea. That was in the early 19th century when Lynmouth and its clifftop twin, Lynton, were "twenty miles from everywhere." The herring fishermen who peopled the village then are now long gone and their industry all but forgotten.

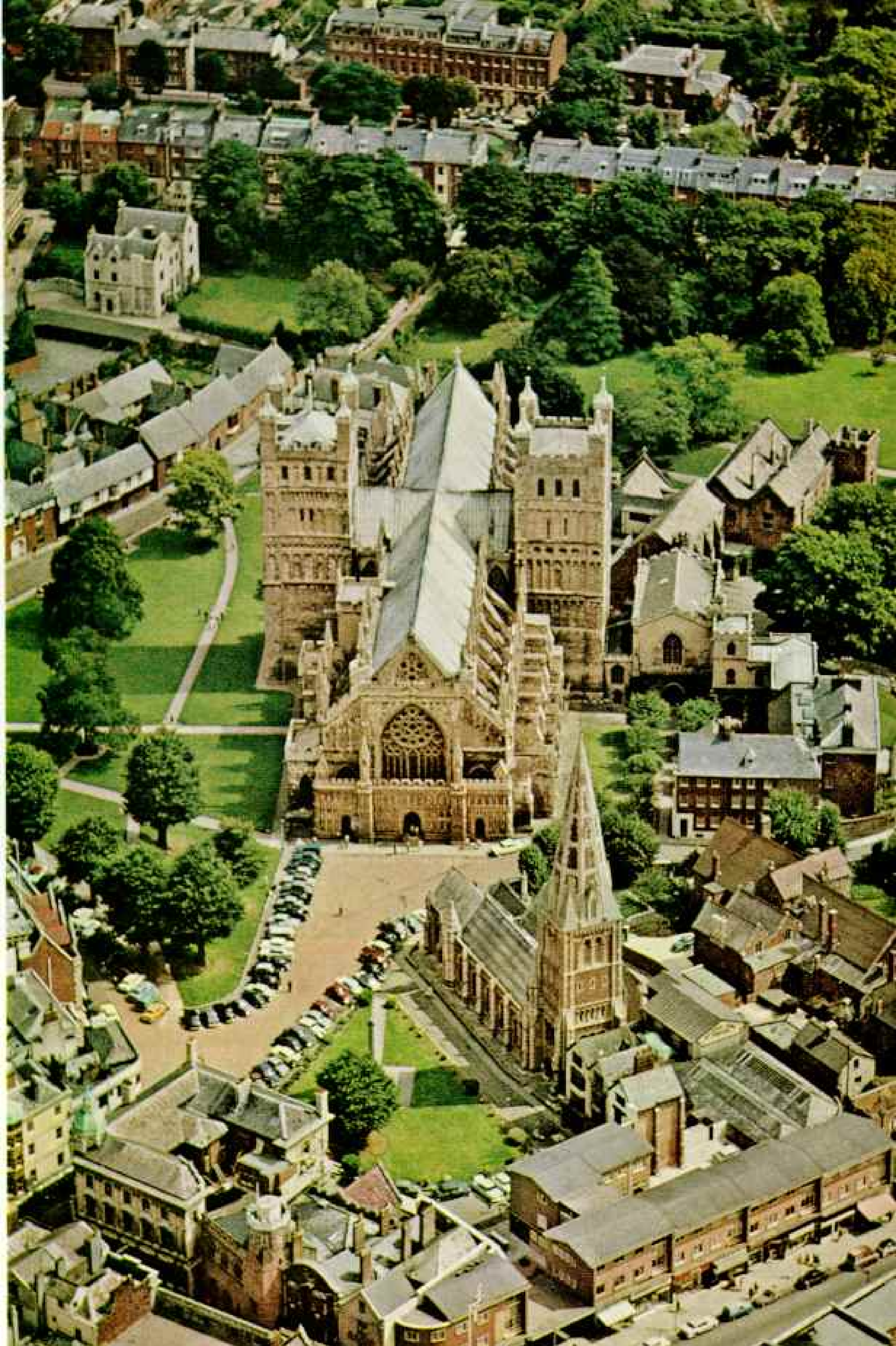
Moor Leads to *Lorna Doone* Country

Exmoor, Devon's other famed moor, beckoned from beyond the East Lyn's wild waters (map, page 211). We zoomed up hills and down hills, steep and twisted. Very soon the hedges and the stone fences fell away. The road was open across the moor. We could see and be seen—no more backing up to let another vehicle or a couple of cows get past.

Our road slipped in and out of Devon and Somerset so that it was necessary to watch the map to see what county we were in. The boundary follows Badgworthy Water—the Badgery, as it is called—made famous in R. D. Blackmore's story *Lorna Doone*. Narrow, ravinelike Doone Valley cuts into Exmoor on the Devon side of the stream.

Exeter Cathedral Endures After Centuries of Strife

More than a thousand years ago a small Saxon church hallowed this site. When the Normans came, they reared a cathedral whose two towers still flank the present 600-year-old edifice. During the 17th-century wars between Crown and Parliament, religious zealots attacked the cathedral, defacing many fine stone carvings. World War II bombs damaged the structure, and restoration still goes on. From one tower a curfew bell rings out each day an old-time injunction to cover any open fires.



Like a blessing, a shaft of sunshine streaming through storm clouds lights a house near Totnes.

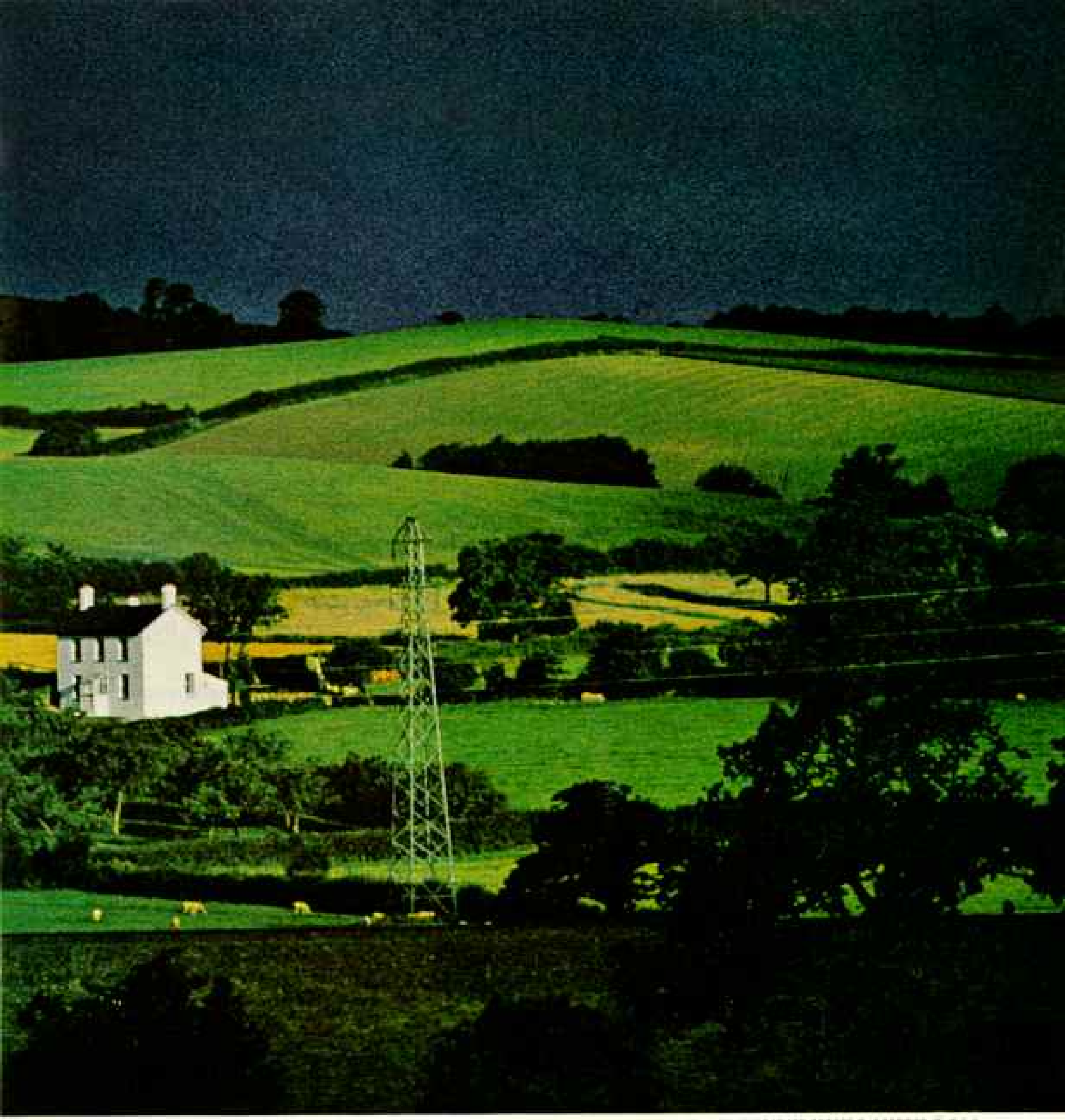
I wanted to see or at least learn something of the Exmoor stag hunting, but it was not the season for it. So we stopped for lunch at an inn set in a deep, sheltered ravine by the banks of the River Barle, at Simonsbath in Somerset.

Diners Leave Food to Join Hunt

A green lawn and flowers led to the welcoming door, and the gurgling of the Barle followed us into the hall. A stag's head stared down on us from the wall. Two fox masks grinned in stuffed perpetuity from another wall nearby.

"Stags?" said the host in a cultivated voice as, tweed-clad and wool-stockinged to the knees, he dispensed a stimulant or two in the warm bar. "Whenever the hounds bring one this way, it empties my house in a flash. The last time the hounds rushed by, out went my twelve diners right away. Out went my bar full. Off went my waitresses, too, in the diners' cars. There wasn't anyone left to serve."

"Yezzur. We take our hunting seriously here," chimed in a customer, looking up from his ale and bread and cheese. "It's been going on since around the year 1200. The rule is if



AQUACHROME BY NATIONAL GEOGRAPHIC PHOTOGRAPHER ROBERT E. GOOKER © N.G.S.

"A few sunny intervals" is a familiar forecast for Devon, a land made verdant by frequent rains

they start a stag or a hind in the village, they bring it back and cut it up here. All the old folk get a piece of fine venison."

I talked with the Devon waitress in the dining room—a pretty girl, about 18, dark hair and black eyes beautifully set off by a pale magnolia skin. We chatted whenever she was not staggering in laden with dishes of rich roast pork, mashed potatoes, and Brussels sprouts out of the garden, or lashings of batter pudding with Devonshire cream, or fritters made wonderfully around slices of Devon apple.

"Where's your pony?" I asked, expecting her to be ready at a moment's notice to join the hunt.

"I go by car," she said. "It's easier that way, until you have to get out and walk."

Which was often and for long periods, I gathered, for it can take time to corner a wily Exmoor stag. He takes to the water to throw the hounds off the scent. He flits into bog-surrounded hideouts, slips down in deep bracken where his horns look like old twigs. Sometimes he even makes a desperate rush for the sea and swims straight out for miles.

I wondered why this pretty girl should be an ardent follower of the hunt. The death

of the noble stag can be an ignoble, messy business.

"It's the excitement," she said, her dark eyes sparkling. "You know, when the hounds dash through the village with the huntsmen after them on their horses, all the men gay in their pink coats, their black caps, and their riding gear—why, you wouldn't stay in here, would you?"

I agreed that I certainly wouldn't.

Exeter Mirrors English History

Below Exmoor the Barle flows into the Exe. We drove through the river valley as far as Devon's county town of Exeter, a city that has been in turn Roman, Saxon, Norman, and still has traces of them all. We gazed on the remains of walls built there by Athelstan, the first king of all England, who died in the year 940.

We walked quietly in the famous Exeter Cathedral (page 235), offered homage at the ancient Guildhall (one of the oldest in England, with a list of mayors rolling back to the year 1200), saw the old Mol's Coffee House, now a gallery in a striking Elizabethan setting emblazoned with the royal arms.

At Mol's, Drake and other sea captains met in a glass-fronted room paneled with oak now grown ebony-black with age. That glass front numbers 230 panes, and not a single one among them square.

History comes alive in Exeter Cathedral with its medieval treasures, its Exeter Book of Saxon literature, its extraordinary and varied sculptures, its tombs where stone figures of knights and robed bishops have lain for centuries.

The Exeter Book was presented to the church by Leofric, husband of the famous Lady Godiva, some 900 years ago, but the ink on its beautifully handwritten pages remains fresh and bright.

There is also the bishop's throne, a rich carved oaken masterpiece that has been preserved with pride since it was made in 1316. It was constructed without a nail in it, so that it could be dismantled and hidden away in times of danger, a precaution that was taken as recently as World War II with its aerial bombings.

From Exeter our road led back across Dartmoor to Plymouth, with a stop at Widecombe Fair. I chose to visit the famous fair by motor coach.

Once outside Exeter, we swung along the main road, but soon left that to follow a narrow gray lane for miles—twisting, gloriously scenic miles—past the wild tors and the rolling downs of gorse and heather, all wild, thick, blooming, beautiful.

The beauty was marred now and then by notices to "Beware of Unexploded Bombs." The driver explained that the area had been used for commando training during the war. It had not been possible to recover all the bombs from the thick heather.

Suddenly in a deep, wide valley, there before us was Widecombe—the maps always add "in the Moor," and Devon people call it Widdykom. My first stop was the imposing church dedicated to St. Pancras.

Devil Rides Down in a Thunderstorm

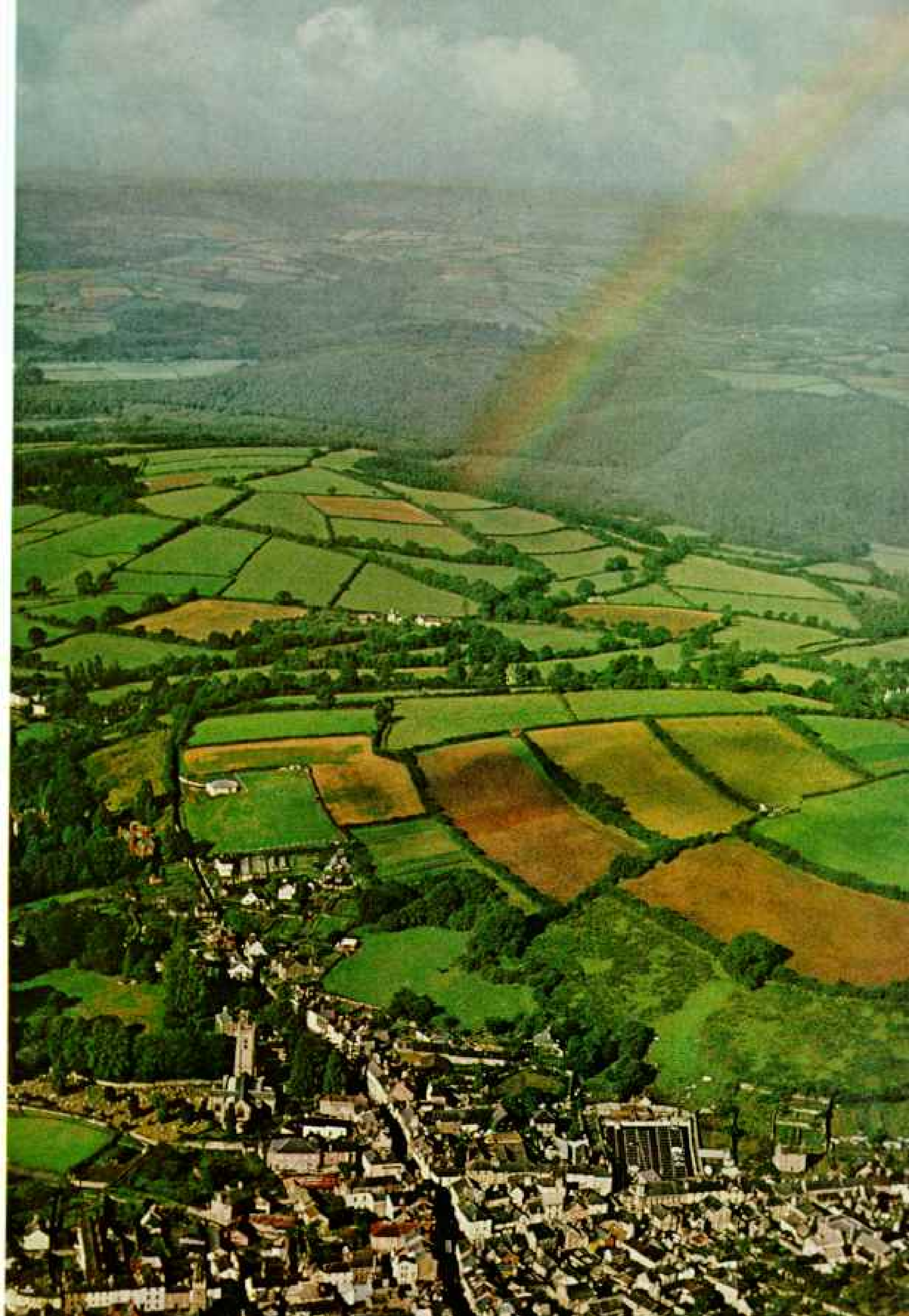
A tablet on the wall honors the memory of several worshipers who were killed inside the church when a stone pinnacle from the 120-foot tower crashed down through the roof, and "a great fiery ball" passed through the structure. The tragedy is attributed to an appalling thunderstorm that filled the valley. This was in October, 1638—barely yesterday in that area.

But the locals give another version. They say the devil came riding to Widecombe through that thunderstorm, in quest of a worshiper who was known for sleeping through sermons. At the height of the storm, though no one was sleeping, the devil threw down the stones.

There was "evidence" that Satan himself had been in the district. That afternoon a stranger called at a nearby tavern and tossed back a pint of ale. As the liquor passed down his red-hot throat, the mistress heard it sizzling like water poured on hot iron.

Probably no adult around Widecombe accepts that version now. But I don't know—old tales, legends, and beliefs die hard in parts of Devon. Only recently, I was told, a schools inspector in religious instruction asked a lad in a Dartmoor village school

Rainbow arches above Ashburton, whose cluster of slate-sheathed houses dates from the 17th century. Once a busy way-stop between Plymouth and London, the town grew on travelers, textiles, and tin mining. It still flourishes as a moorside market town.



GOLDEN LION HOTEL

what did he know of the ways of the devil?

"Why, sorr, he lives over to Widecombe," was the surprising answer.

I didn't see any special sign of the devil at Widecombe Fair, but Old Uncle Tom Cobley was there on his mare. We learned that piece of folklore in Melbourne, and the song that goes with it.

When the wind whistles cold on the moor of a night
All along, down along, out along lee,
Tom Pearce's old mare doth appear ghastly white
Wi' Bill Brewer, Jan Stewer, Peter Gurney, Peter Davy, Dan'l Whiddon, Harry Hawke, Old Uncle Tom Cobley and all. . . .

They borrowed the mare to ride to the fair; but the seven of them rode the poor old horse to death.

The 1960 Uncle Tom was on a robust gray mare, by himself. His beard was false, and he was selling programs for the fair.

Down to the Sea Again

I returned to Plymouth, thinking that it was high time to hoist sail again and sweep through the blue waters along Devon's smiling coast. So early one morning we pulled out from our berth at Mill Bay, and *Tectona* ran along with the west winds across The Sound, past the mouth of the Yealm, on into Bigbury Bay. We hurried under plain sail past Hope Cove, where the locals were once described as the "worst wreckers in all England." The men there went to bed at night praying to the Lord to send them a "proper wreck," by which they meant a ship full of a rich cargo, with no survivors.

The wind freshened and *Tectona* stormed along at nine knots. It was exhilarating to be offshore again, looking at Devon, that land of great sailors, from the rolling sea.

We hadn't noticed just how much the wind and sea had gotten up, running before them, until we turned in to cross the Salcombe bar.

By then, we were fighting a moderate gale.

"Keep her up! Head into wind!" Tom Blackwell shouted as the stout ketch leaped and rolled, pitching her bowsprit into the sea

Puffs of smoke wreathe the chin of Ashburton's town crier, Fred Wills. Criers once shouted news and weather, but today the post has become ceremonial. Wearing the town crest and carrying a bell, Wills attends the portreeve on a civic occasion (opposite).

and almost wallowing her rails under. Spray from breaking seas drove mast-high.

A road of white water indicated the bar. Bolt Head, bleak and rock-strewn, offered no shelter; the wind swung around it in one direction at sea level and burst over the top of its gaunt, black-buttressed head in wildly varying williwaws. The cold Channel seas snarled across the bar, and the seaward end of the bay was a wild heaving of waters.

"This is where Tennyson wrote 'Crossing the Bar,'" shouted Ike Marsh, "but I guess he was inside when he did!"

Indeed he was, as we found out from the locals when we got the anchor down. Lord

Sprig of greenery certifies the ale served by the bareheaded host of the Golden Lion. In a medieval rite, Dr. Ivan Barling, portreeve of Ashburton, leans from his horse to present the symbol attesting that the inn's ale was not found "wappy," or flat. Official tasters in formal dress stand at foot of steps. Marshals with staves keep order. Office of portreeve goes back to Saxon days; Dr. Barling is the 1,141st to hold the title.

Leaping a hogsback, 15-year-old Jennifer Eden and her pony Blue Mist show good form in a horse show in Ashburton. "Devon is full of little girls on fat ponies," reports the author.

Tennyson was inspired to write the immortal poem, they said, when he gazed on the scene from shore.

Salcombe is one of the fairest ports of all the beautiful coast of South Devon.

"No wonder yachts stay for years, once they get in," said young Edwin. "Look at that funny old bunch of yachts up there!"

Round a bend in the estuary, in a place called the "Bag," were big racing yachts looking as if they had come straight out of the 1890's, slim steam yachts even more elderly, and several hulls of PT's from both World Wars. Families were living aboard all of them. Few looked as if they ever went to sea.

Azorean Fruit Once Scented Salcombe

No longer does the sweet smell of clipper schooners in with Azorean fruit rise on the balmy Devon air. Once these swift and graceful vessels slid down the ways at Salcombe and Kingsbridge nearby. They used to beat out to the Azores and race home again filled

Elegant in topper and pink coat, Albert Jenkins serves as ring guard at the Honiton Show. His horn relays judges' commands to contestants. Medals show service in India and two World Wars. Leather bag holds binoculars.

In full pursuit, horsemen and baying hounds follow a stag in an 1807 aquatint. Today as then, Exmoor turns out for the hunt, if not to ride, then to watch. Citizens desert the villages and seek the hilltops to cheer on the pink-clad horsemen.

PRINT AFTER SAMUEL HOWITT, COURTESY PAUL MELLON COLLECTION

with their cargoes of oranges and pineapples.

At the old Ferry Inn, the floor had been relaid with teak from the decks of the four-masted bark *Herzogin Cecilie*, wrecked off Salcombe in the 1930's. It was odd for me to stand on those teak decks again in this incongruous setting: I'd last trodden them on the big four-master's 96-day run around the Horn from Australia in 1928.

Yachting and summer visitors are Salcombe's main business now. Every summer day yachts big and small race about the roomy harbor, from swift little dinghies with two masts—these are the well-known Salcombe yawls—to the ocean-cruising craft of Blue Water Charters and the Island Cruising Club (pages 246-7 and 248).

One of the latter, a rakish schooner named the *Hoshi*, came sailing in from France as we entered the harbor. In command was a young woman, walking the small poop and shouting her orders in a refined and very English voice. She, her mate—a woman attired as a French fisherman—and every tar in her mixed crew were club members.

Vessels Manned by Volunteer Sailors

Half a dozen such ships sail beneath the colors of the Island Cruising Club, I learned, and none ever lacks a volunteer crew. Students of seamanship flock to Salcombe, eager to serve in any capacity to feel a surging deck beneath their feet.

What particularly astonished my old salts was the amazing number of attractive young women willing to work as cooks or in any menial job aboard the yachts.

Moored near us was an elderly Thames barge called the *Violet Sibyl*, her blunt and roomy hull made over into accommodations.

We visited aboard. Seated on deck, outside the enormous galley, two very pretty girls—vacationtime sailors—were peeling potatoes. One was a nurse and the other a school teacher.

"This is fun," they told me.

Alan and Peggy Marshall of Blue Water Charters conduct a sailing school from the ancient *Violet Sibyl*.

"I used to be an engineer, slaving away ashore," Alan told us. "I'm glad I changed that life for this!"

His wife smiled her full approval.

It was a Saturday when we sailed, and Salcombe's broad estuary was full of dinghies and yawls and larger yachts, conned by anyone from an eight-year-old girl to an ancient grandfather.

The Channel was racing with white caps outside, but the bar was as Lord Tennyson had depicted it:

> *But such a tide as moving seems asleep,*
> *Too full for sound and foam. . . .*

We jumped a bit but, once outside, we ran for Prawle Point and Start Point. The wind was southwest again, as it is so often in the Channel, and a lollopy sea picked up the round rump of the ketch now and again almost playfully, as if to hurry her along. She took a bit of water into the scuppers, but the sun was shining and the decks soon dried.

It was pleasant sailing, though we had to give the coast a wide berth off the points because of the racing waters that surge over the foul ground there.

The rocks which form the coast of South Devon are old and hard, but the sea gnaws into the bases of the cliffs and brings them down in time. The fallen rocks create dangerous submerged ledges, churning the surface waters into a fury while the sea further attacks the cliffs.

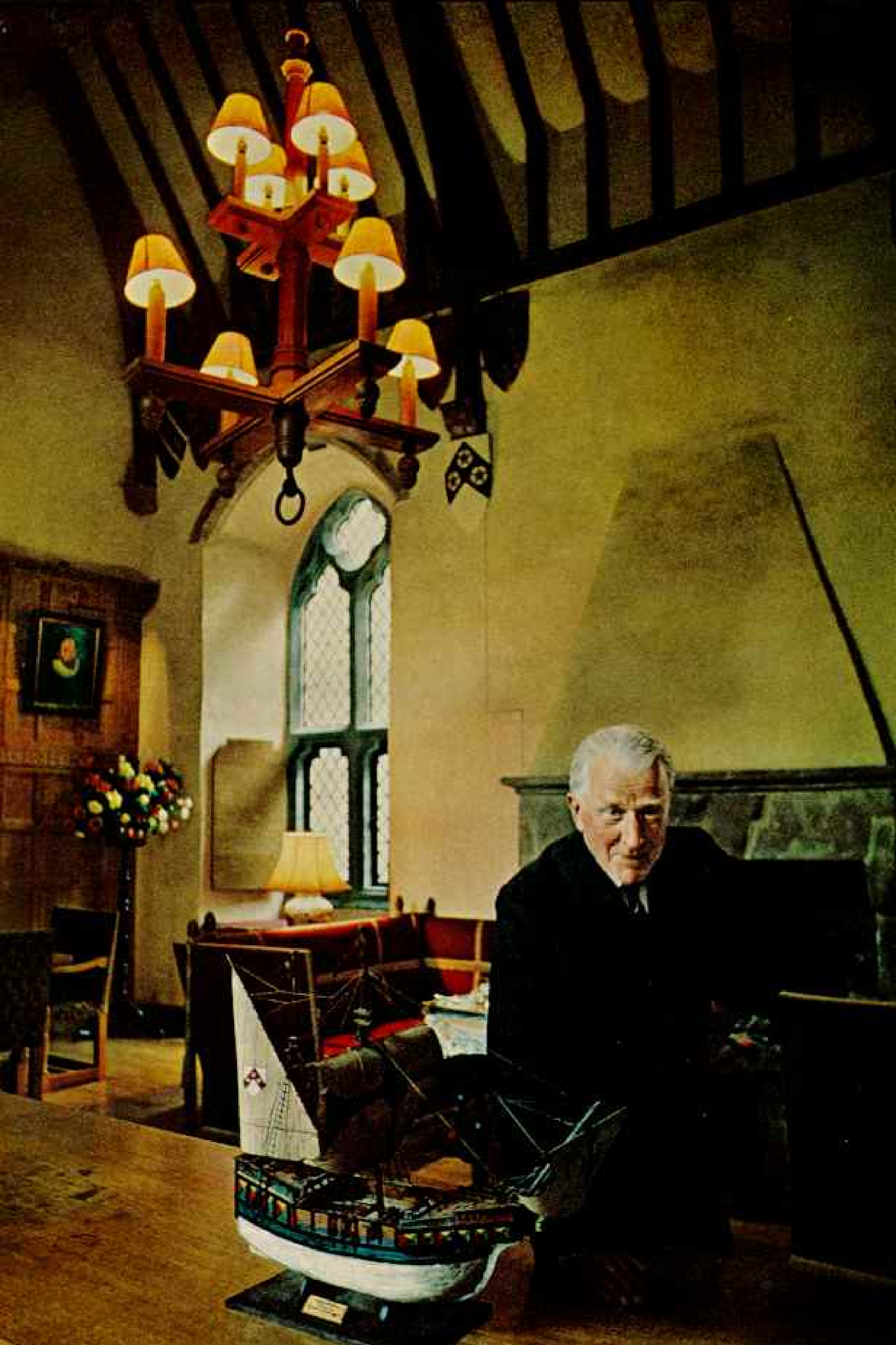
Start Point is one of the worst of these areas. The tide turned against us there, and against the wind too. We jumped and bounced about with a sort of corkscrew motion. Young Edwin clambered to the bowsprit-end, the better to enjoy this spectacle.

Soon the safe haven of beautiful Dartmouth, at the mouth of the River Dart, was under our lee. We made for it.

At Dartmouth there is no sea-raising bar off the entrance. All the tidal rocks are close inshore out of the way of ships, with plenty of deep water in the sheltered channel which twists between high wooded hills. Once the ship is inside, those twists assure good shelter from all winds.

On either shore stands a castle—a "Strong

At home in Compton Castle, Comdr. Walter Raleigh Gilbert stands beside a model of the little frigate *Squirrel*, on which his famous ancestor Sir Humphrey Gilbert was lost at sea after taking possession of Newfoundland in 1583 for Queen Elizabeth I. The commander and his wife have restored the family's manor house, begun in the 14th century. They have given it to the National Trust, though they continue to live there.



"Salcombe homes cling to the hillsides like limpets to a rock," reports Captain Villiers.

and myghtye and defensyve . . . tower," as the old chronicle describes one of them—between which a great chain could be slung across the harbor, as a medieval boom defense. Those towers have stood since the 15th century, but they still looked strong and good.

History drips from the waterside stones, and illustrious and romantic names from the great past come to a gusty life. In my mind's ear I heard the cries of Elizabethan seamen, and the chants of 12th-century knights echoing down Dartmouth's narrow streets as they awaited the sailing of the Second Crusade.

A flock of graceful swans made way for our boat to secure alongside in Bayard's Cove, one of many snug havens in Dartmouth's harbor. From such a setting, John Davis sailed in search of the Northwest Passage.

Splayed fingers of the Salcombe River offer hospitable harbor to hundreds of yachts

In our own time, some 480 ships of the Royal Navy and the U. S. Navy and Coast Guard set out from the Dart to make their rendezvous with history on the beaches of Normandy on June 6, 1944. Their decks were crowded with U. S. invasion forces. Most of South Devon was temporarily American then.

I walked to Slapton Sands, on the coast near Dartmouth. I liked the look of Slapton, with its long lagoon and its regular shingle beach (page 210).

This had been a famous battle practice ground prior to the landings in Normandy. Local residents had evacuated the area. More than a dozen villages and scores of farms had been abandoned. There had been nothing like it since the attack on Calais in 1346, when 31 ships sailed to join King

Edward III. At his side was his standard-bearer, Sir Guy de Brian, who later founded a chantry at Slapton; the tower of this medieval chapel can still be seen.

At the end of World War II, the U. S. Army erected a memorial obelisk at the edge of the sea. I read that it was

> "... presented ... to the people ... who generously left their homes and their lands to provide a battle practice area for the successful assault in Normandy in June 1944."

I had a beautiful walk that day, through quaint and peaceful villages with names like Stoke Fleming, Stokenham, Torcross, Strete. I enjoyed breathtaking views of the great arc of the Devon coast, bejeweled with golden sands, indented with little bays, fronted with bold cliffs.

The Britannia Royal Naval College, Britain's Annapolis, is the dominant feature on the hills of Dartmouth (page 250). The college was opened in 1905 to replace the training ship *Britannia*, which had been moored in the Dart since 1863. The captain told us that three of Britain's kings had been midshipmen here, along with a host of other embryo admirals aged (when at Dartmouth) anything

Crewmen hike as a Salcombe yawl beats to windward. The two-masted, 16-foot yawl developed into its present design from crabbers' boats which had a similar rig.

On their feet, racers prepare to jibe as they round the leeward mark during the annual August regatta in the Salcombe estuary. These dinghies of the Solo class, whose numbers now approach 600, call for extreme skill in handling.

upward from 13. While we were about, the Queen's sister, Princess Margaret, Countess of Snowdon, arrived by naval helicopter for the graduation-day parade.

Servant Thinks Raleigh Afire

We took a trip up the Dart by paddle-steamer, a graceful little vessel that looked at least 50 years old and drew about three feet of water. These paddlers are so unusual and so charming that there are societies in England dedicated to their preservation. Ours slid along with her masthead brushing the branches of trees, while a guide pointed out places of interest like picturesque Stoke Gabriel, with the tower of its 13th-century church, and a place called Greenway, where Raleigh is said to have smoked the first pipe in England.

The story is that a servant seeing Raleigh sitting with his face seemingly afire doused his master's whiskers with a jug of beer, spoiling both the beer and the tobacco.

Beautiful woods and rolling, rich lands line the Dart as far as the ancient port of Totnes —present head of navigation—and beyond. At Totnes old houses reach out above the sidewalks to rest upon pillars that line the roadway. Overhanging stories provide shelter

Narrow Fore Street shows Salcombe's age. Kings Arms Hotel had stood for some 50 years before Charles I lost his head in 1649. His face appears on the sign.

Lone helmsman must handle the sail, steer, and serve as ballast. One of the liveliest yachting centers in all England, Salcombe offers sailing instruction in everything from estuary racing to Channel cruising.

AS EXTACHROME BY ROBERT E. GOODMAN © N.G.S.

for shoppers, while a stream of automobiles moves slowly up or down the one main street and negotiates a narrow passage with a building arched across.

I remember Totnes as the place which provided the treenails for the fastenings of *Mayflower II*.

Treenails are wooden pins which, driven carefully home, used to hold the planks to ships' sides. Stuart Upham found all he needed for the *Mayflower II* in an old cider press at Totnes. So the cider-stained treenails of Totnes hold the ship together to this day.

Brixham Remembers the *Mayflower*

Brixham is on the Devon coast around the next headland from Dartmouth. We sailed out of the Dart and around the corner. We gave *Tectona* all the sail she had, but she just stood there in her own reflection, waiting for a breeze.

Finally a wisp of wind sprang up to waft us along to an anchorage inside the Brixham breakwater.

Ike Marsh and I went ashore to look the old town over. Visitors were crowding the locals off their own sidewalks; cottages and caravans were crowding the very grass off the hills; strangers thronged the wharves to stare at the fishermen and their sturdy diesel vessels.

Across the little harbor we read a strange new sign: LIDO CAFETERIA. Stuart Upham's former offices and draftsmen's rooms were now a restaurant, and the flat clifftop there was set out with gay tables. A large painting

White Ensign dips in homage as future naval officers rehearse for a visit by the Queen.

Britain's Annapolis, Britannia Royal Naval College at Dartmouth, trains officers for the fleet. Main buildings opened in 1905 to replace a sailing ship in the River Dart that served as a school.

Clove hitch secures a rope under the eyes of Malayan, English, African, and Pakistani cadets.

Terraces of Torquay Shield
Fleets of Pleasure Boats

For six centuries, the quiet tempo of village life revolved around nearby Torre Abbey, founded in 1196. Torquay, with its Riviera-like climate, began to boom during the Napoleonic Wars when British naval officers of the Channel fleet brought their families to live here.

of *Mayflower II* adorns one wall of the building. Vacationers sit at the tables, dining and watching the traffic in the little harbor.

Around the crowded streets many strangers recognized us.

"Hallo there, Captain! Glad to see you."

"What cheer, Ike! Have a good trip?"

It was three years since we'd sailed out of Brixham on the first leg of our voyage to deliver *Mayflower II* to New England, but

apparently no one had forgotten ship or crew.

Just across Tor Bay is Torquay, a town built up on terraces of flowers. The waterside streets rise tier upon tier, each full of gay villas planted with a subtropical profusion of fuchsias, mimosas, flowering palms (above).

Torquay today may be Devon's holiday town No. 1, but many thousand years ago it was something else—a domain of prehistoric beasts. Fossil remains of the woolly rhinoceros, cave bear, and mammoth have been found in a remarkable cave called Kent's Cavern, in Torquay.

With them were skeletons of prehistoric man. Segments of deposits 11 feet through, twice protected by floors of stalagmite material, contain bones, relics, and objects used by man going back at least 100,000 years and perhaps as many as 500,000.

From Torquay we took a short trip by

open-top-deck bus to the fascinating village of Cockington. Well, not quite, for Cockington is right out of this world. Public transport is not allowed to enter the village.

Cockington's famed blacksmith sells brass pixies now, but the smith can still shoe horses, and does. His smithy is festooned with cards bearing visitors' names from the ends of the earth. Everybody who goes to Devon sees Cockington. To us, it had almost a film-set look. But Cockington is real, and has been real for a long, long time. Records indicate that the De Cockington family had already settled here in the 12th century.

Blood-red Cliff Looms on Coast

We sailed again at dawn. It was one of those perfect mornings with a gentle soft air coming up from the south, mild and pleasant, barely enough of it to move the galley smoke. We were all up to enjoy the view and bask in the balmy weather.

At first the Devon coast was half hidden in a summer mist, from which it slowly began to emerge—very slowly, as if allowing us to take in at one time only as much as we could properly appreciate.

The sun came up with a rose-pink tinge, and the last of the mist rolled inland. We were drifting with bare steerageway past a high cliff, and its red face gleamed as if warming to the early sun.

According to local tradition, this was because the cliff was stained with the blood of Devon men and Danes who had died fighting there in the days of the Viking raids.

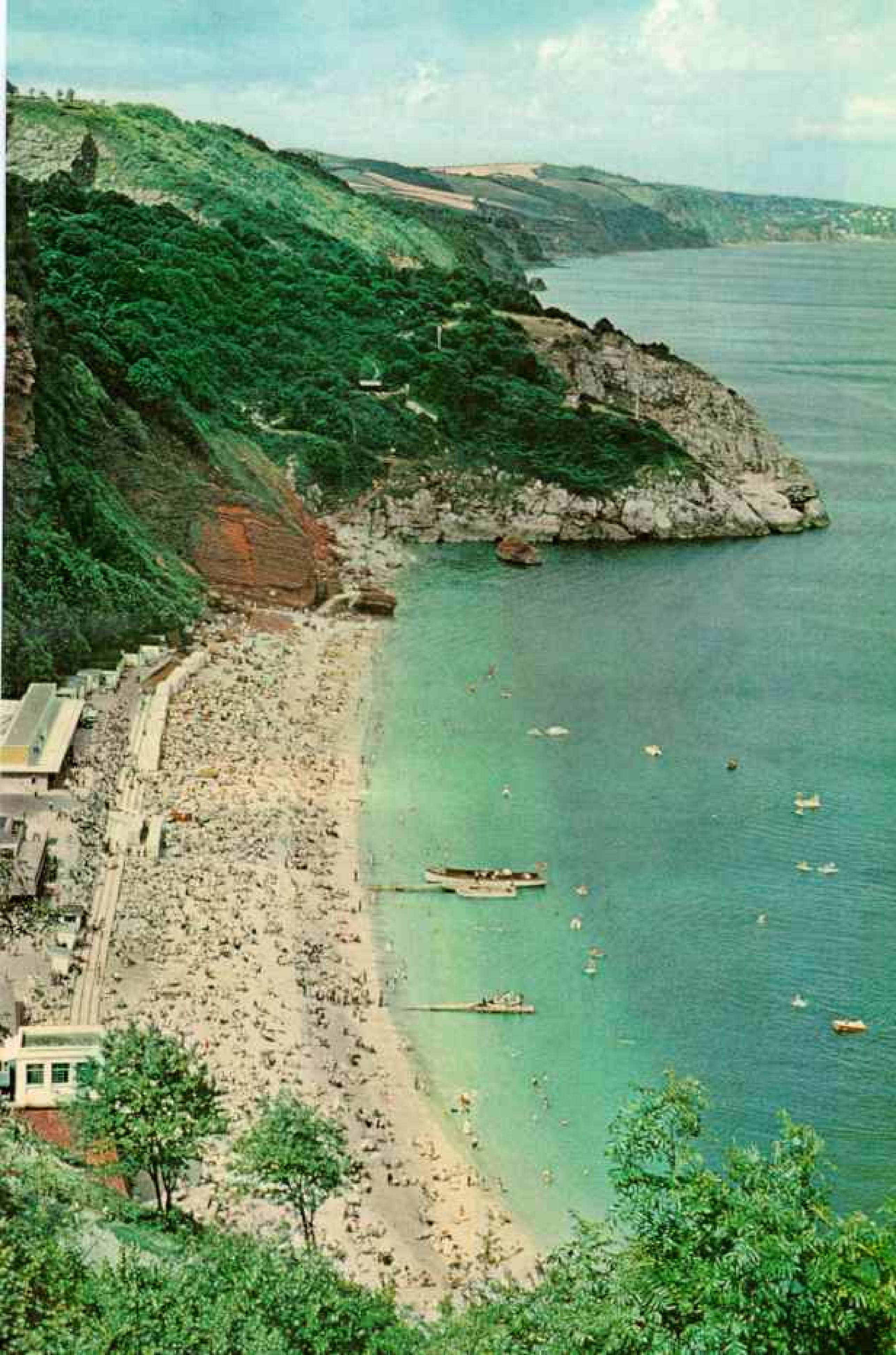
All that South Devon coast is fascinating. We sailed around for weeks, touching at the tiny port of Beer, a fishing village noted not for breweries but for the skill of its womenfolk at making hand lace. They told us that Queen Victoria's wedding dress was fashioned there, and *she* was particular. At Beer, the red rock of Devon becomes mixed with the white cliffs of England. It is odd how the white chalk, so familiar up-Channel around Dover, stops abruptly here.

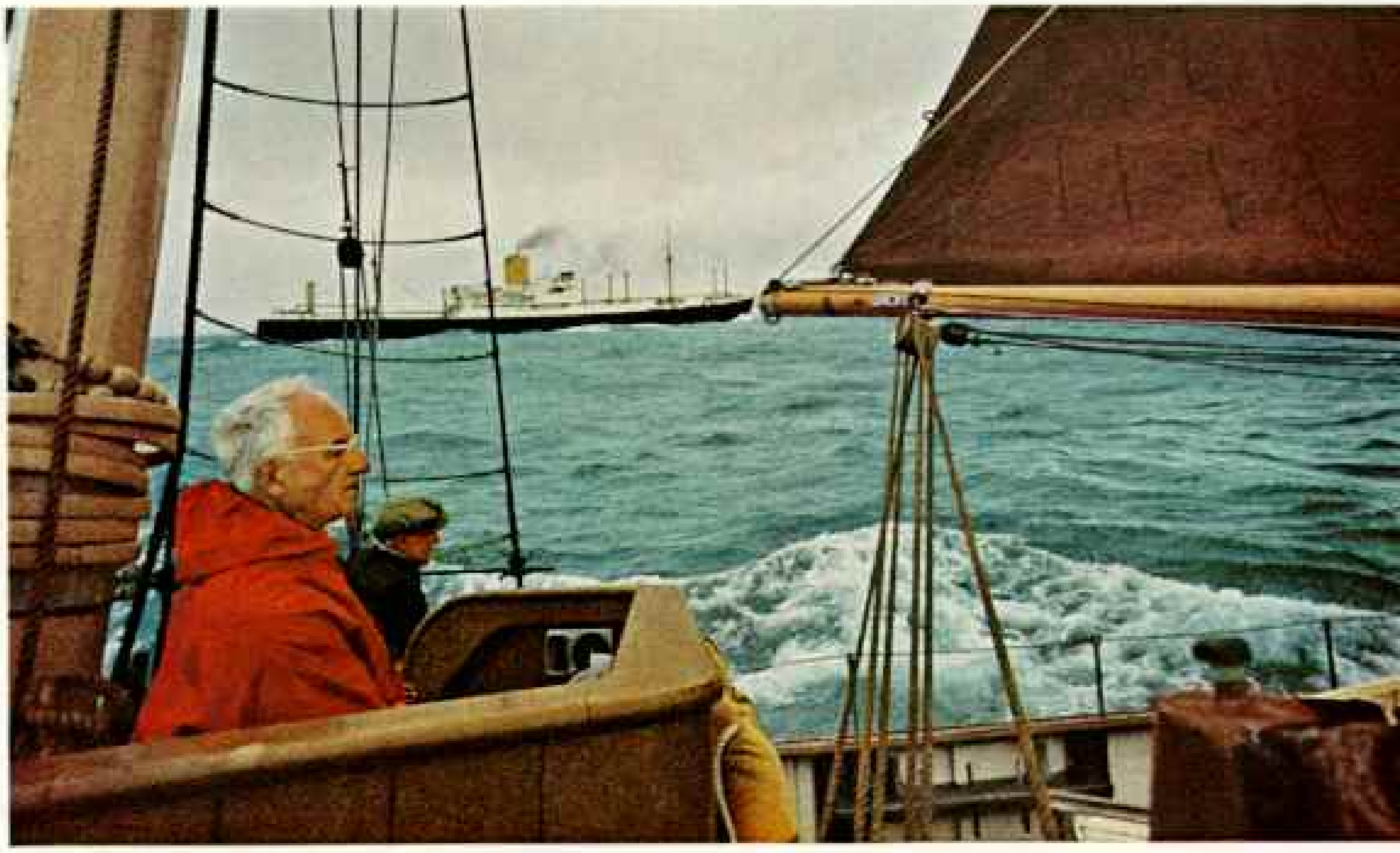
Yarns of smugglers and of wrecks are still told around Beer. Bovey House, a large Elizabethan residence near Beer, has a hiding place inside one of the chimneys. Another has been found 30 feet down in the side of a 180-foot well shaft in the grounds.

Around all Devon, almost any old house, any cliff or cave, any gnarled old stone outcrop can throw a piece of history at you, of

Names out of *Alice in Wonderland* identify look-alike beach huts at Beer. Rain keeps vacationers indoors. Even the Welsh corgi takes shelter.

Holiday horde soaks up the summer sun at a Babbacombe beach. Cliff walks link Babbacombe to other protected beaches in the Torquay area.

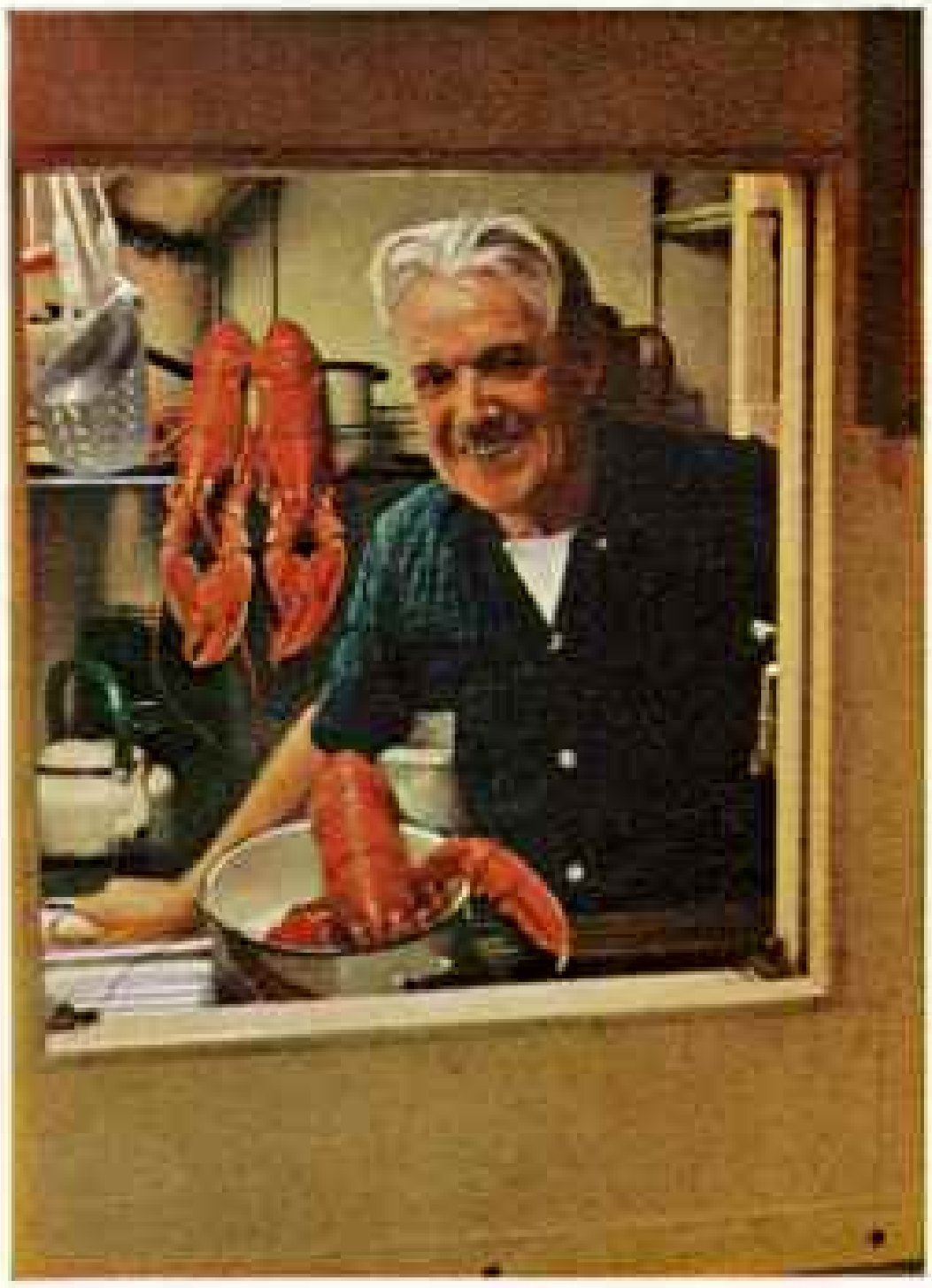


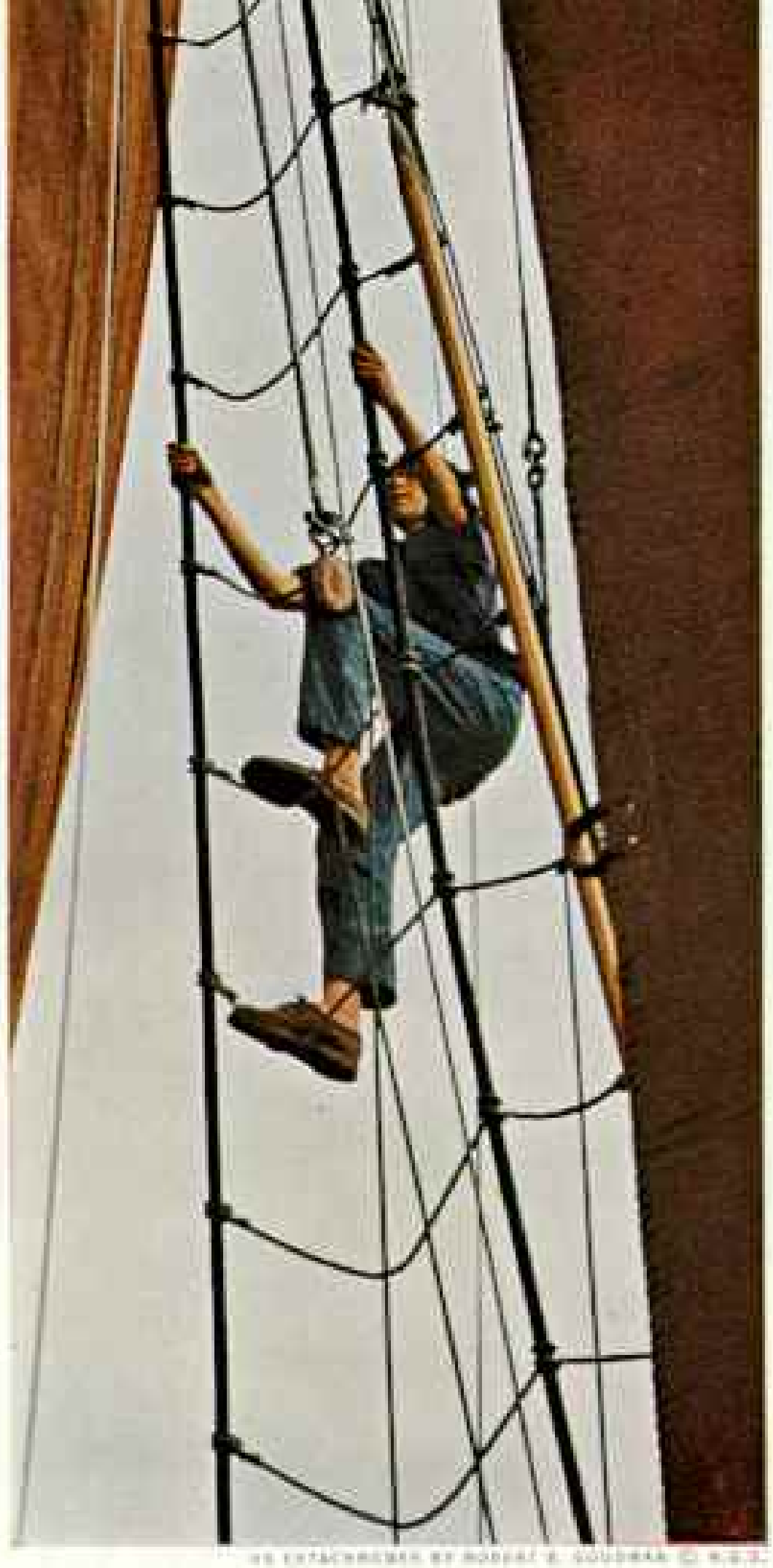


Sailor's life

TECTONA runs free where the Spanish Armada once sailed. A cargo ship churns to port as Mel Grosvenor mans the helm. His son, fisherman Edwin (below), heads for the galley with his catch of mackerel. Comdr. Tom Blackwell (lower left) helps "roll the cotton"—furl the jib.

ECKACHROMES BY MELVILLE BELL GROSVENOR





Lobster feast coming up! "Succulent, and meaty," says Captain Villiers of the Devon shellfish. Old-timer Ike Marsh (above) served as bosun of Mayflower II. *Peter Lisle-Taylor (right), one of* Tectona's *crew, climbs the ratlines, rope steps lashed to the shrouds.*

a woolly rhinoceros or a hiding Royalist, of clash with Viking or raider from France, of smuggling and fighting, of quiet courage against heavy odds, of little ships and big-hearted men setting out to pit themselves against the unknown.

Romance of Sail Grips Crew

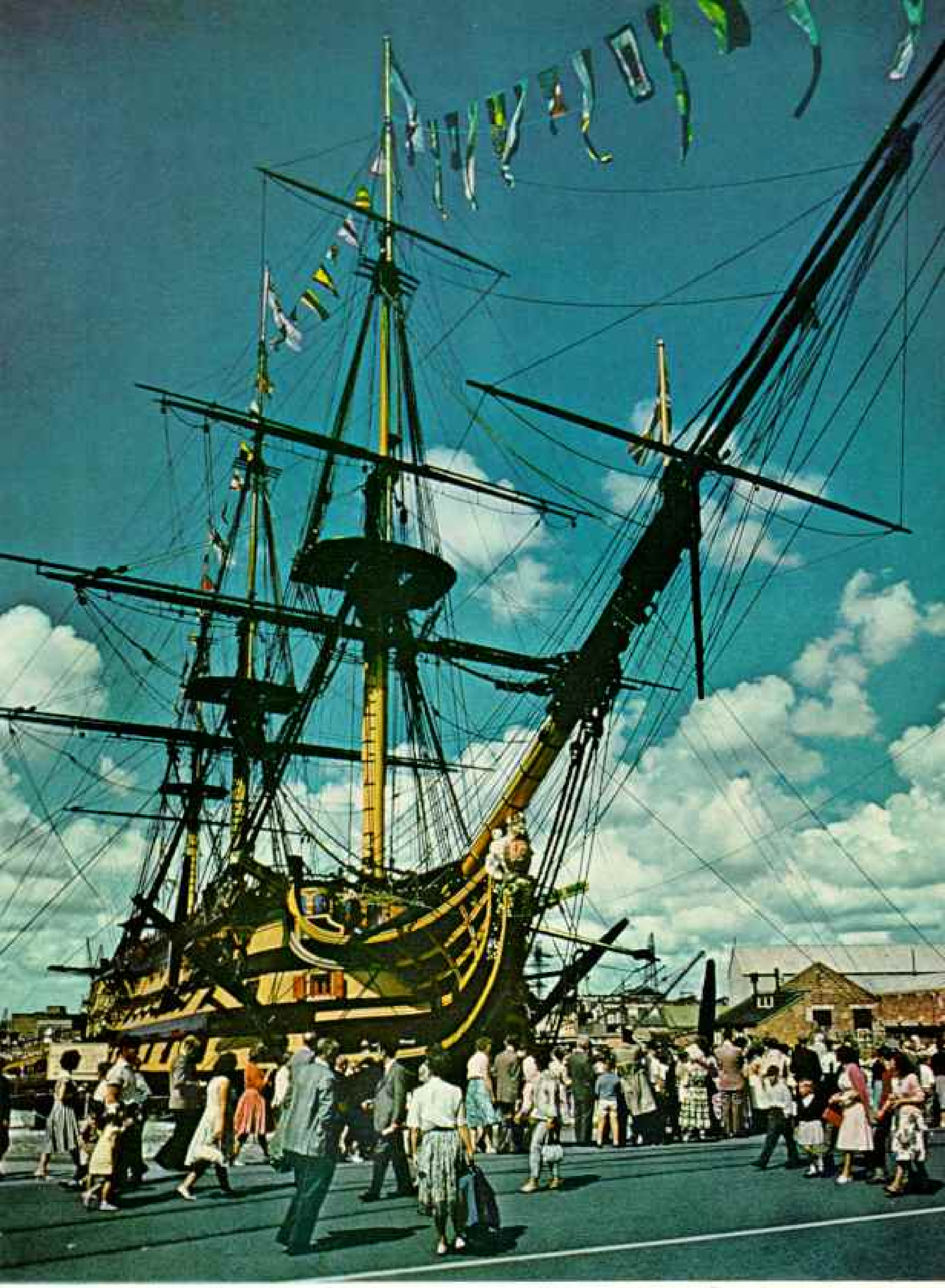
The short summer nights made pleasant sailing. Often the helmsman did not want to be relieved. He just liked being there, grasping the businesslike spokes of *Tectona*'s wheel, keeping her on course with the white water at the bow and along the sides throwing up a bit of light, and the great shapes of the brown sails curvaceous and beautiful against the stars—to paraphrase Masefield's "Sea Fever," the wheel's kick and the wind's song, and the tall ship sailing. This was it!

Through a beautiful night we rolled quietly and steadily along the hallowed, shallow waters of the ancient Channel, in the wake of a thousand illustrious vessels from the colorful past. We ran on at a gentlemanly five or six knots. At the moonset about half after midnight, Mel Grosvenor—who had the watch then with Nigel Glassborow—told us to look out for the orbiting American satellite Echo, due to pass over. But with the typical perversity of Devon weather, clouds suddenly blotted out the sky.

In the morning at dawn there was the gray Bill of Portland, Dorset's crooked finger in the Channel, just where it ought to be. *Tectona* rolled and pitched along, while young Edwin let out a whoop and hauled in a mackerel. A dozen more struck at his hook as quickly as he paid his line out, and the lad had just time to unhook them and throw them in a pan before another and another struck (opposite).

Ike took them straight below from the Channel to the frying pan—and that is the way to eat mackerel.

At midday we were rounding St. Catherine's Point, southern tip of the Isle of Wight. Some drizzle blew up. The Isle of Wight



Honored veteran of old sea battles, H.M.S. *Victory*, Horatio Nelson's flagship, stands preserved at Portsmouth. Flags on the nautical shrine here spell out the Admiral's message to the fleet at Trafalgar: "England expects that every man will do his duty." Shortly after hoisting the signal, Nelson fell wounded on the ship's deck and died in its cockpit.

clouded over, low mist hanging on the seafront towns. The wind freshened a little, as the ship came up to it.

We recalled that history was made here off St. Catherine's not so long ago. This was the assembly area into which nearly all the ships, large and small, of the Normandy-bound invasion fleet came streaming silently before the break of dawn on that long and fateful day in June of 1944. After rendezvousing, the ships looped around this area before heading out into their appointed channels toward touch-down in France. The swing-around area was circular, and its code name was Piccadilly Circus.

Now, as we came sailing homeward, only a few coasters tossed there, with the deep-sea steamships farther out. But I would never forget the night I led my squadron of Lend-Lease LCI(L)'s around that circus and swept off down the right channel toward the forbidding French beach that awaited the assault troops crowding our decks.

With the west wind now abeam and a growing tide carrying us forward at an increasing clip, we snored along toward the offshore fortresses which mark the entrance to Portsmouth. Tom Blackwell conned *Tectona*. Mel Grosvenor had the helm, oil-skinned there and smiling, as happy as an Oliver Twist who'd just been given two plates more.

This was the kind of sailing we all loved. The sea flattened out in the lee of the land, and the wind sang a louder song in the taut weather rigging.

Tectona Runs Nautical Obstacle Course

With this wind we could sail right into Portsmouth, with careful steering. We'd have to get the canvas off her smartly as she rounded up for her buoys.

Mel kept the wheel. He had the "feel" of the ship.

The darkness soon deepened, and the harbor ahead filled with lights—flashing lights, fixed lights, some red, some white. Often they flashed right on the brown sails. Tom knew them all and sang out their identifications.

A big liner was coming out, one of the great Cunarders bound for New York. A submarine —a big one, perhaps one of the *Oberon*-class giants—was bound in toward Portsmouth. We gave both a wide berth.

Ferries came charging down the fairway. Black shapes of liberty boats made inward toward the naval harbor. The dark tide swished by, helping us. Sometimes, as a full sweep of tide caught *Tectona* beam on, she was swept sideways alarmingly toward the great buoys. Mel had to head the ship crabwise, like an airplane in a crosswind, to follow the lead marks up the channel.

Wind and rain increased. Eddie and the boys looked out in the bows. With the tide, *Tectona* was making ten knots.

We shot through the darkened water, at last safely inside.

But we still had to weave through crowded shipping and find our buoys. Portsmouth is a naval harbor, full of dark ships in mothballs, and destroyers, frigates, submarines, carriers in commission.

Night Veils Safe Moorings

Tectona slipped along, past the Isle of Wight ferries berth. On she sailed almost under the stern of the great Admiral's *Victory* (opposite). The Trafalgar flagship, launched in 1765, was a veteran already when Nelson died aboard her in 1805. Now she is preserved in Her Majesty's Dockyard, a memorial to a great moment in British naval history. The tracery of her high rigging loomed over us. Lights shone from her tiers of great cabins.

But there was time for only a quick look.

We sailed along the length of a huge aircraft carrier with an angled deck, and the acres of gray side that towered skyhigh above us took the wind and made the ketch hard to steer.

In among laid-up carriers and cruisers we twisted and turned. Tom peered out carefully, looking for his marks.

We ran down the mains'l, gathered it in, leaving the ship under fore stays'l and mizzen, her speed dropping.

On she came, around the stern of the last big carrier. There were the buoys! From the wheel they could scarcely be seen. Her sideways crab was accentuated now.

Skilled judgment was necessary to lay *Tectona* on her crablike course, playing wind and tide so that she would just nicely make the buoy, not slam ashore beyond it.

It was pitch black.

"Buoy ahead!" shouted Ike.

Precisely at the right moment, the bow came slowly up to the buoy. Ike dropped the small boat overside, and the buoy ropes were on in a flash.

It was a grand finish for a great cruise.

THE END

Fluorescent Gems From Davy Jones's Locker

Article and photographs
by PAUL A. ZAHL, Ph.D.
Senior Editorial Staff (Natural Sciences)

ODD REQUESTS from her science-minded husband don't often surprise my wife Eda. But she was taken aback one evening when I marched into her kitchen, ultraviolet lamp in hand, and asked her to turn out all the lights—even the bulb in the refrigerator.

"Whatever for?" she asked.

"You'll see," I answered.

In the darkness I played the invisible beam from the lamp over the refrigerator

shelves. Instantly eggs became deep pink. Bottles of milk took on a yellow tinge. Lettuce showed traces of vermilion. By a process known as fluorescence, the contents of our icebox glowed in a variety of eerie colors. Under the stimulus of ultraviolet rays, the objects created vivid light of their own.

The same phenomenon can occur almost any place —in your home, among plants in a garden, in living things of the sea. I had become intrigued by fluorescence in marine life, and wondered if it could be recorded by color photography. The refrigerator experiment was a test for a lamp I was trying. And the pictures on these pages—showing living things of the ocean in rarely photographed splendor—are the result.

Luminescence, of which fluorescence is a form, has

Corals glow with eerie beauty under ultraviolet light (top), in contrast to the same organisms under natural light. Exposed to ultraviolet, body substances fluoresce; leaf coral shines bright green; frilly flower coral, vivid blue. Porous prong of a stinging coral overlaps stony algae.

Stone antlers and lily pads sprout in Key Largo Coral Reef Preserve, Florida. Ultraviolet lamps reveal fluorescent colors in such growths.

been studied since the 17th century. In 1602 a Bolognese shoemaker and amateur alchemist found that rocks from Italy's Monte Paterno, if heated and allowed to cool, continued to shine for a time in the dark. This simple discovery—that some substances radiate light under given conditions—has led to applications of immense practical value: the television picture tube, the physician's fluoroscope screen, the long white tubes that provide illumination in millions of offices and homes.

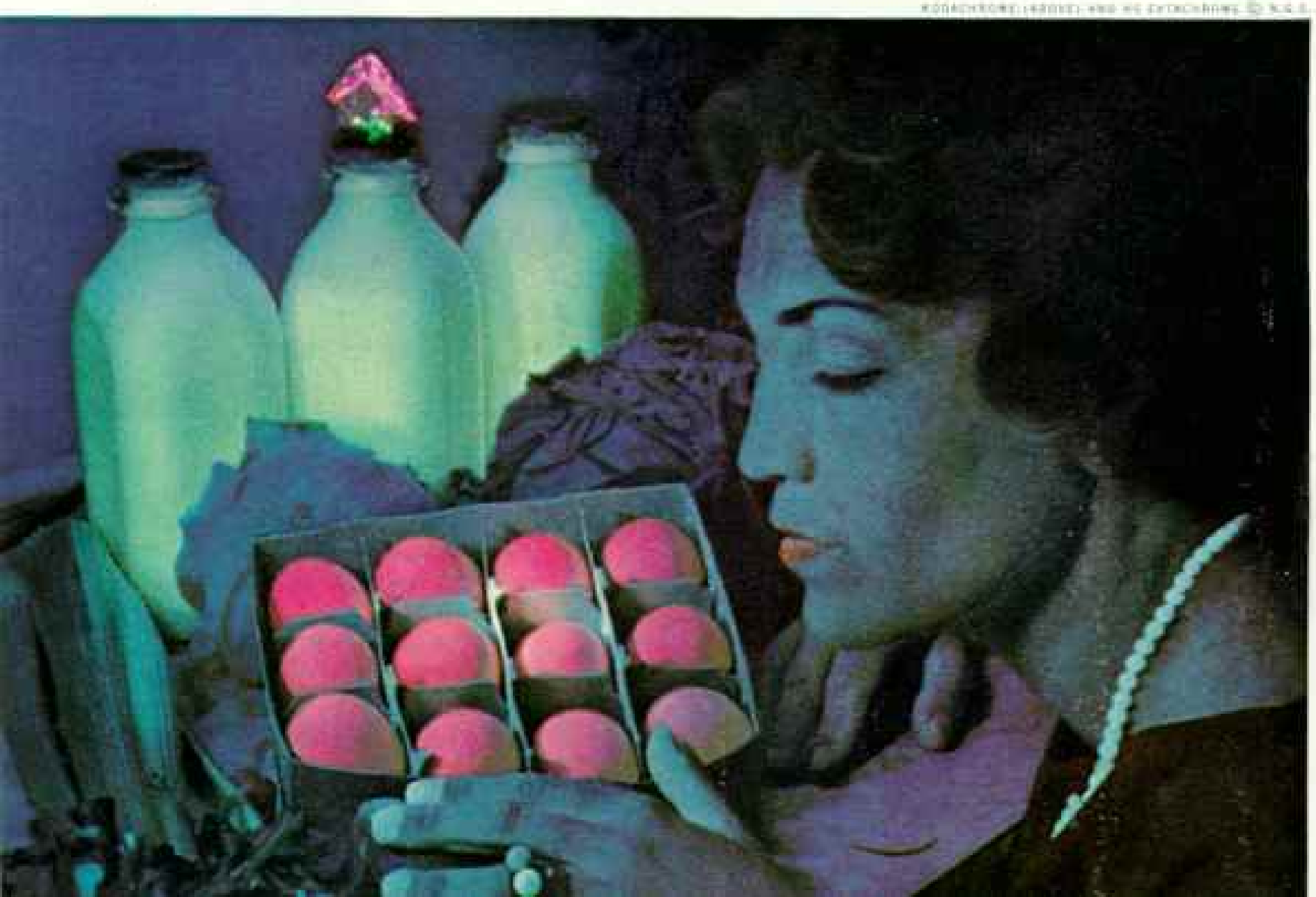
Why do things luminesce? To begin with, all matter is composed of atoms. Around each atomic nucleus electrons whirl, like planets around the sun. Sometimes outside stimulation—heat, pressure, X-rays, ultraviolet—can force certain electrons to change their orbits slightly. Struggling to regain their normal tracks, they give off energy.

That energy may take the form of light. If the rays are of one particular wave length, they strike the eye as red; those of another wave length appear blue; and so on. The effect is fluorescence when it is caused by certain

The Author: This article marks staff naturalist Zahl's 29th appearance in NATIONAL GEOGRAPHIC since 1949. As it was being prepared for press, Dr. Zahl and his cameras were in remote Borneo seeking the world's largest carnivorous plants.

Groceries in a kitchen appear prosaic in ordinary light, but, like many objects, they contain fluors, whose electrons emit colored light when stimulated by ultraviolet lamps.

Eggs turn deep pink and Mrs. Zahl's pearls gleam in ultraviolet light. Manganese ore atop a milk bottle gave the author a known level of fluorescence with which to test his film. Certain wave lengths of ultraviolet can damage eyes and skin and require extreme caution.



kinds of light such as ultraviolet or X-ray beams and ceases when the beam is cut off.

Substances with the ability to fluoresce are called fluors. They exist in both living and inanimate things. The chlorophyll in plants glows a dull red. Crystals of vitamin B2 fluoresce with dazzling effect.

Fluorescence Aids Cancer Search

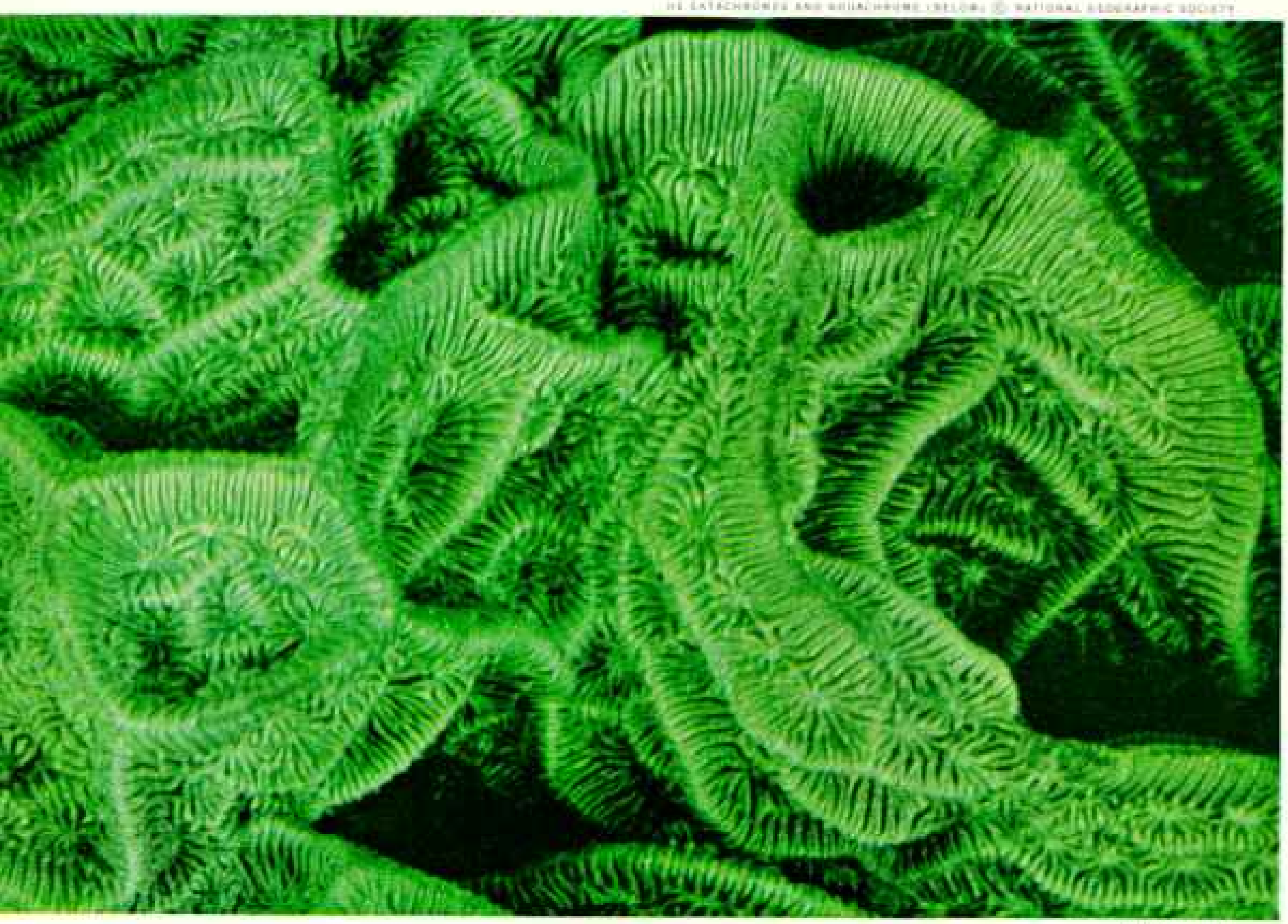
Researchers have discovered that cells in some cancers will absorb the fluorescent drug tetracycline and can thus be distinguished under ultraviolet light from healthy cells.

Altogether, considerable attention has been paid to fluorescent properties of plant and chemical substances. But in the realm of sea life, little has been done.

My interest in exploring this fascinating marine field stemmed from a casual observation by my colleague Luis Marden of the NATIONAL GEOGRAPHIC staff. Diving in the Red Sea in 1955, he noted that anemones on a reef 60 feet down glowed vividly. Surprisingly, the coloration failed to show up in flash photographs he made of them.

Wrote Marden in the February, 1956, NATIONAL GEOGRAPHIC: "I think this may be a case of fluorescence, where some pigment . . . excited by the blue-green light, fluoresced bright red. . . . The photoflash, being predom-

Gooseneck barnacles stand on their leathery pedestals in the sea. Demure in natural light, shells and stalks become palettes of color as their electrons dance under ultraviolet lamps. Bits of dead seaweed glow bright yellow; live seaweed seldom fluoresces. Plumed appendages waving from gaping shells are modified legs with which the crustaceans sieve food from the water. In some countries the flesh of gooseneck barnacles is considered a delicacy. Medieval myth, believed for centuries, held that migratory geese hatched from barnacle shells attached to trees.



Leaf coral's sinuous folds fluoresce gray green; in sun they are dull brown. With some corals, limy skeletons glow but flesh does not; in others, the bodies shine but stony deposits remain dark.

Translucent egg cases of a sea snail festoon the branches of a hydroid (below). Encased eggs resemble tiny pearls. Stimulated by ultraviolet (opposite), both eggs and cases turn bright blue.

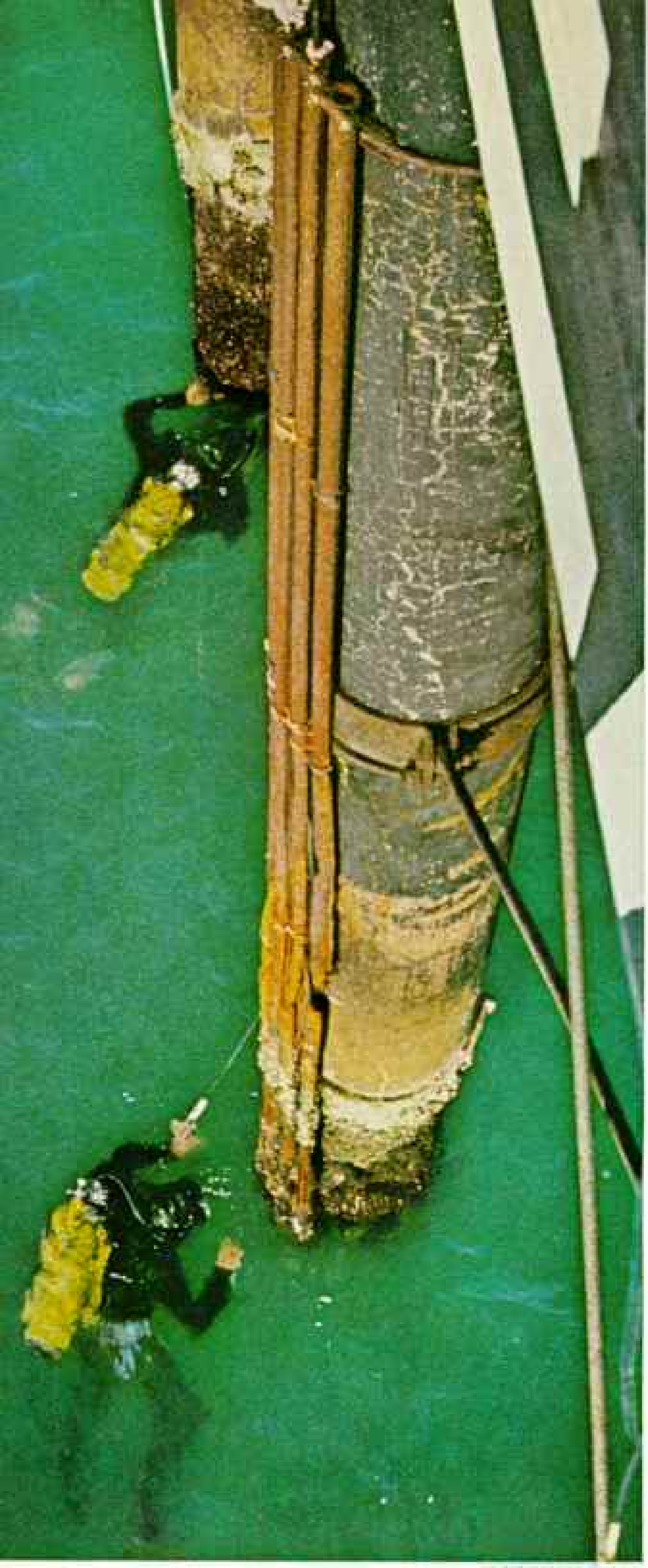
inantly red, would not excite a fluorescent substance, and the animal's normal coloration would appear in the photograph."

Three years later a French biologist, René Catala, provided proof. He found that corals brought up from the deeps off the South Pacific island of New Caledonia changed colors when exposed to ultraviolet light.

Questions Lead to "Black-light" Tests

Would other marine organisms respond to ultraviolet, I wondered? What wave lengths would penetrate water most effectively? How strong should the rays be to bring out maximum fluorescence? Would they be harmful to creatures of the deep? Would fluorescence register accurately on color film? The quest for answers led me on a search of two oceans, collecting specimens from as deep as 1,200 feet.

To begin, I tested ultraviolet lamps of many types. Some emitted beams of limited power;



Divers hack at marine organisms growing on the piling of a pier off La Jolla, California. They seek anemones for the author to photograph (pages 268-9). Tricky swells make their work hazardous.

others were strong enough to cause fluorescence in objects many yards away. I turned the beams on paper with mineral coatings of known fluorescent quality—arranging pieces at various depths in an aquarium and analyzing photographs made of them. I subjected plants to different periods and intensities of ultraviolet irradiation, seeking clues to dosages that living tissues could tolerate. Finally, I tested special filters designed to prevent ultraviolet rays from entering the camera and spoiling the film. At last I was ready for the ocean itself.

Sea-floor "Trash" Transformed

In Gulf Stream waters near Cape Canaveral, I sailed aboard the U. S. Fish and Wildlife Service exploratory motor vessel *Silver Bay*. It was near midnight, and our ship's tackle creaked as an open-mouthed dredge dragged the bottom 360 feet beneath us.

"Sixty-ninth haul for this area," said Harvey R. Bullis, Jr., as we waited for the drag to complete its prescribed 30 minutes on the bottom. Mr. Bullis, Director of the Service's Exploratory Fishing and Gear Research Program in the Gulf and Caribbean area, was taking sample counts of scallop concentrations. But my own interest lay in what dredgers call "trash"—the miscellany of organisms collected at each haul.

"Up she comes!" a crewman shouted. The dredge's iron-mesh net clanked against the ship's side, to be eased over the gunwale and upended on deck (opposite). Out spilled a small mountain of scallops, starfish, coral, algae, anemones, urchins, mud, sand, and debris.

While the scallop counters went about their work, I warmed up one of my ultraviolet lamps. Soon I was ready, and a "lights-out" signal went up to the bridge. Floodlights on the ship winked into darkness, and all was black save for the purplish emanations around the face of my lamp.

I played the invisible beam over the pile on deck. Instantly it became an enchanted treasure, a-glitter with strange, subtly colored gems. Some were pink or red, some ghostly green; others sparkled like constellations. Mud, sand, and dead debris remained unseen, like the black velvet on which a gem merchant displays his wares.

Twelve-foot maw of a chain-link dredge yields a haul of Gulf Stream bottom dwellers to scientists aboard *Silver Bay*, U. S. Fish and Wildlife Service research ship. As drab as trash in normal light, the author writes, the organisms became "an enchanted treasure, a-glitter with strange, subtly colored gems" under ultraviolet.

Poison-bearing tentacles hang from the gas-filled float of a Portuguese man-of-war. Sting capsules bead the streamers.

HS EXTACHROME (ABOVE) AND KODACHROME BY PAUL A. ZAHL © NATIONAL GEOGRAPHIC SOCIETY

Angry welts of a man-of-war's sting stripe the back of Robert P. L. Straughan. Collecting coral for the author, he surfaced amid tentacles. Their venom caused excruciating pain and tortured breathing that Mr. Straughan called "the most horrible experience of my life."

Here, three days later, he holds a branching gorgonian, a horny coral.

The crewmen and I marveled at the transfiguration wrought by the ray. Now and then one of us would pick up a bit of coral, or an anemone, or a starfish, and hold it close to the lamp. One creature might glow soft and subdued; another lurid and bright; another not at all. I selected many for my collection, then signaled the deck lights on again. In a flick, the twinkling jewels were replaced by a heap of drab trash.

By the end of a week at sea my buckets were crowded with living specimens, and I was ready for phase two of the project. The *Silver Bay* put me ashore at Fort Pierce, Florida. Then, lest spoilage affect my fragile cargo, I drove post-haste to Miami, where I met my old friend Robert P. L. Straughan, a professional collector of marine organisms.

Bob and I took my carload of buckets to his field station on Key Largo, 60 miles south of Miami. There, in a two-room laboratory only a stone's throw from where dense mangroves arch their roots into the sea, the hum of pumps and the gurgle of aerators bespoke a home for my deepwater animals. They joined a menagerie of reef and lagoon dwellers that Bob had accumulated in anticipation of my arrival.

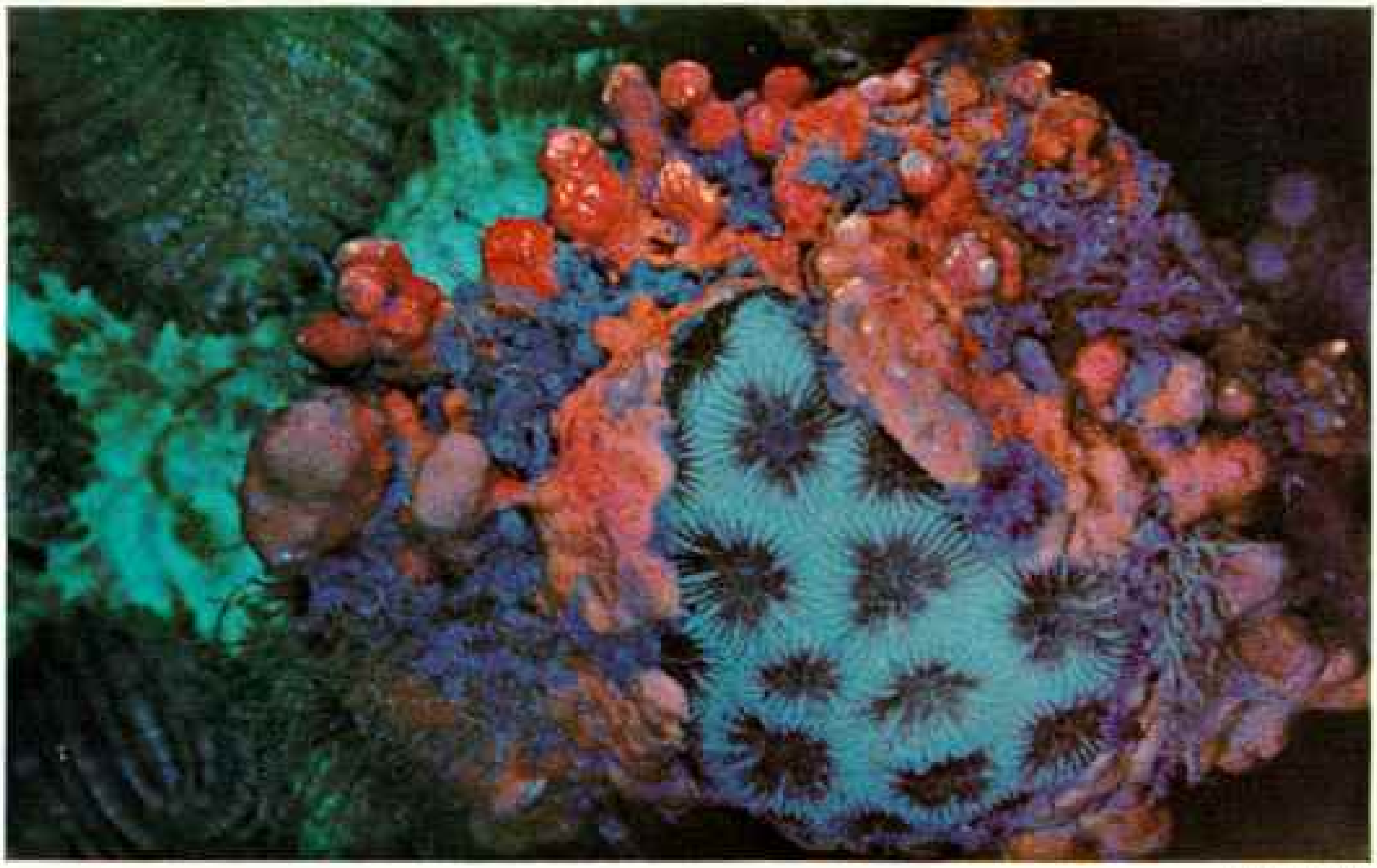
That evening I set up my gear. When darkness was complete, I flipped the switches. I turned the lamps toward a tank of *Condylactis* anemones, and even I was amazed. What had been drab gray-green or pinkish tissue burst into an unearthly glow of blue white. Bob's face, close to the aquarium's glass front, became a sinister mask of chalky blue. His teeth shone like radiant pearls.

For a while we watched and admired. Here was proof positive that marine fluorescence is not limited to deepwater forms; these anemones came from depths of less than two feet. Then I went to work with my camera.

Anemones Become Delicate Living Gems

Ultraviolet light causes three members of the species *Corynactis californica* (upper) to contract into rosebudlike forms. Emerald *Anthopleura xanthogrammica* is normally copper green because of algae living in its tissues.

Flowery crowns of *Corynactis* anemones open in natural light. Fingerlike tentacles sweep food particles into the animals' conical mouths.



Fluorescent tangle of pink and blue, stony algae spill across a lump of star coral. Blue-dotted ridges of rose coral show at upper left. Color differentiation under ultraviolet light provides a research tool in many fields.

Fiery colors erupt from stony algae bathed by ultraviolet light. Feathery hydroid festoons a sprig of sargassum weed. Each bead on the branching filaments is a minute polyp. A single digestive tube joins all the colony's mouths.

Natural light reveals a miniature world of sea life swarming about the weed's stalks and gas-filled floats. *Bunodeopsis* anemones wave translucent tentacles on floats at left.

Liveliness of the anemones provided our most trying photographic problem. Our lamp beamed more ultraviolet energy than brightest sunlight; often anemones reacted by speeding tentacle movements or contracting trunks —blurring the long exposures needed to record fluorescent colors on film.

Bob and I became so engrossed in our photography that almost an hour elapsed before a smarting of our eyes—which should have been goggled for this work—warned us that we should take a break.

Outside, the night was warm and soft, and we could hear the squawk of a heron in a mangrove at the shore. We squatted by the jetty, idly tossing pebbles into the black water while our eyes rested.

Inside once more, we aimed the unseen beam of our "black light" at one glass tank after another. Lowly corals, whose reef-building skeletons make them the planet's mightiest masons, fluoresced with intensities ranging from subtle to garish. Each species—indeed, to some extent each individual—had its own color pattern and color quality. In one species, stony parts of the animals glowed, but their fleshy polyps remained dark. In another, polyps shone while limestone dwellings were unaffected.

Why fluorescence occurs in one marine species and not in another, in some minerals but not all, is still a puzzle. *Condylactis* fluoresces, but related anemones do not. Some calcites fluoresce, others don't. Many vitamins of the A and B group do, vitamin C doesn't. The lens of your eye fluoresces, but not the iris. Perhaps the ability to change radiant energy from the invisible to the visible is merely a chance by-product of the way some atoms and molecules are put together.

Whatever the explanation, the brief intrusion of my ultraviolet beam under the lid of Davy Jones's locker leaves no doubt that the sea abounds in far more potential color than daylight reveals. And, for that matter, so does my wife's refrigerator. THE END

My Life Among Wild

A courageous young British scientist lives among these great apes in Tanganyika and learns hitherto unknown details of their behavior

SUN'S FADING GLOW on *Lake Tanganyika silhouettes the author, preparing for a lonely nightlong vigil among the chimpanzees.*

Chimpanzees

By JANE GOODALL

Photographs by Baron Hugo van Lawick and the author

UP ON THE MOUNTAINS the midday sun glared fiercely, but down in the valley near the swift-running stream it was cool and still. I stood listening until I heard a faint rustling of leaves—the only sound to betray the presence of the group of chimpanzees I was trying to approach.

Slowly and quietly, but making no attempt to hide, I moved toward the great apes until I was only thirty feet away. As I sat down, they watched me, staring rather hard, and a young female who had been lying on the ground climbed a little way up a tall fig tree.

One of the males stood upright to watch more closely. He was a superb specimen, standing about 4½ feet in height, his massive shoulders and bull neck suggesting the tremendous strength in his arms. He must have weighed a good 130 pounds, and he was strong enough to snap with one hand a branch so tough that a man would be hard put to break it with two.

Later I was to learn how it feels to be slammed on the head from behind by a large male chimpanzee, but fortunately for me he did not continue his attack.

After a moment or two, the group stopped looking my way, recognizing me for the strange hairless primate they had grown accustomed to seeing amid the other mountain fauna. The six adults rested on the ground or stretched out along the branches of a wild fig. Nearby, four youngsters played quietly.

I thought then, as I always think when I am face to face with mature chimpanzees in their native forests, of the striking difference between the wild apes and those in captivity. The chimpanzee imprisoned behind bars is bad tempered in maturity, morose, moody, and frequently rather obscene; in his freedom he is majestic even when excited and, for the most part, dignified and good natured.

For about an hour I sat with the group. Then one of the males stood up, scratched thoughtfully, and moved off down the valley. One by one the others followed, the infants riding astride their mothers' backs like diminutive jockeys. The females and youngsters stared at me as they passed. The males scarcely glanced in my direction.

Africa Fulfills a Life's Ambition

To be accepted thus by a group of wild chimpanzees is the result of months of patience. In England, before I commenced my field study, I met one or two people who had seen chimpanzees in the wild.

"You'll never get close to chimps—not unless you're very well hidden," they told me.

At first it seemed they were right, but gradually I was able to move nearer the chimpanzees, until at last I sat among them,

Unique scientific record, says Smithsonian's secretary

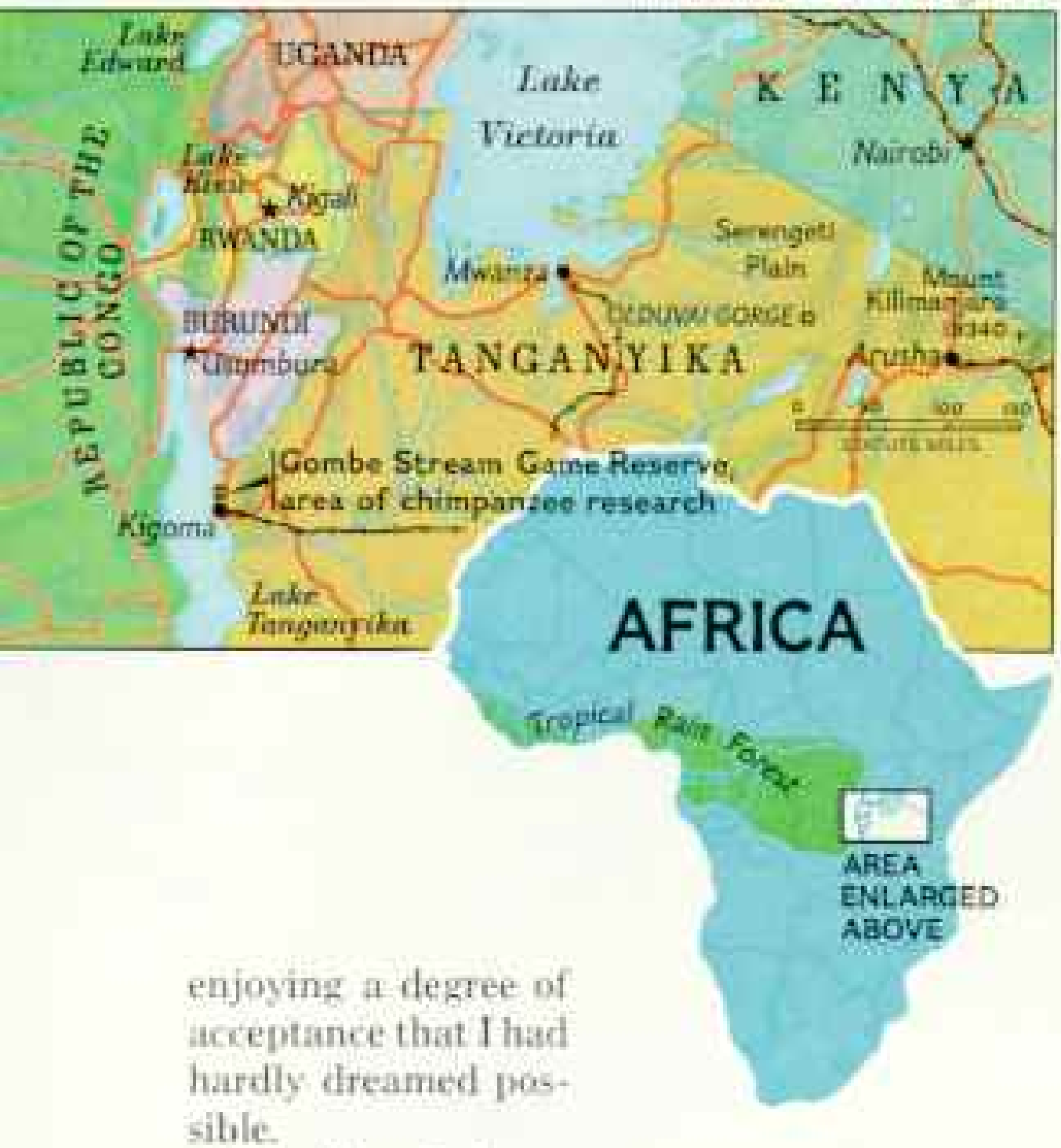
CHIMPANZEES are in many ways the most interesting of the great apes, which as a group are man's closest animal relatives. Jane Goodall, the writer of the present article, is a modern scientific zoologist whose research has been supported in part by the National Geographic Society. She has not been content, as so many others have been, to study chimpanzees in the restricted environment of laboratory or zoo cages. She journeyed into the African forest and lived alone for many months with these powerful and potentially dangerous animals, and scientifically observed all aspects of their behavior as they ranged freely over hills and valleys.

The author who has conducted these arduous field studies is a charming young Englishwoman and a candidate for the degree of Doctor of Philosophy at Cambridge University. She has discovered much that is new about wild chimpanzees. They fashion and use tools. They control the behavior of other chimpanzees by vocalizations of various sorts. They capture and eat animals for food. They have a complex social life, which includes a long period of care of the young and various forms of play, such as a stylized display which the author calls a "rain dance." This study throws important light on general anthropoid behavior in animals that have almost human brains but lack the power of speech or the ability to transmit from generation to generation social discoveries by the use of written symbols.

Many experts fear that the African forest where these great, almost human animals with their good brains and strong hands now live may soon be taken over for agriculture. It is thus possible that the interesting account given here will stand for all time as a unique record in scientific zoological literature because the opportunity to make such field studies may soon be lost forever.

Leonard Carmichael, Secretary of the Smithsonian Institution and Chairman of the National Geographic Society's Committee for Research and Exploration

David Greybeard, a wild chimpanzee, gets a handout of bananas from author Goodall, who studies the apes under a National Geographic Society grant. This scene near her camp represents a triumph for Miss Goodall; at first the animals fled if she came within 500 yards. Knapsack holds camera and notebook. She carries a whistle in her pocket to summon searchers in case of accident in the rugged Tanganyika hills.



Great Apes Rule a Tiny Domain on Lake Tanganyika's Eastern Shore

Gombe Stream Game Reserve, only area in Africa set aside specifically for chimpanzees, spreads across 60 square miles of forested valleys and treeless ridges north of Kigoma, Tanganyika. A safari in 1942 confirmed the presence of apes along the lake shore, and Great Britain established the sanctuary. Tanganyika, now independent, continues to protect the animals. Chimpanzees on the reserve belong to the subspecies *Pan satyrus schweinfurthi;* they number between 60 and 80. Others in Africa inhabit dense rain forests.

enjoying a degree of acceptance that I had hardly dreamed possible.

At this intimate range, I observed details of their lives never recorded before. I saw chimpanzees in the wild hunt and kill for meat. Though this had been suspected, nobody dreamed that a chimpanzee would attack an animal as large as a young bushbuck, until I saw an ape with his kill.

Most astonishing of all, I saw chimpanzees fashion and use crude implements—the beginnings of tool use. This discovery could prove helpful to those studying man's rise to dominance over other primates.

Chimps Threatened by Civilization

I cannot remember a time when I did not want to go to Africa to study animals. Therefore, after leaving school, I saved up the fare and went to Nairobi, Kenya (map, above). There I was fortunate in meeting and working for Dr. Louis S. B. Leakey, then Curator of the Coryndon Museum. After a year, Dr. Leakey asked me if I would undertake a field study of chimpanzees.

Although the chimpanzee has been known to science for nearly three centuries, and although, because of its striking resemblance to man, it has been used extensively as an experimental animal in medical and other fields, no attempts had been made to study this ape in its natural habitat until Dr. Henry W. Nissen made his pioneer study in French Guinea. I found his 1931 report invaluable as I prepared my own program.

The primary aim of my field study was to discover as much as possible about the way of life of the chimpanzee before it is too late—before encroachments of civilization crowd out, forever, all nonhuman competitors. Second, there is the hope that results of this research may help man in his search toward understanding himself. Laboratory tests have revealed a surprising amount of "insight" in the chimpanzee—the rudiments of reasoned thinking. Knowledge of social traditions and culture of such an animal, studied under natural conditions, could throw new light on the growth and spread of early human cultures.

Nineteen months after Dr. Leakey suggested the field study, I had received funds for a preliminary investigation from the Wilkie Foundation, Des Plaines, Illinois, which supports studies of man and other primates. I was ready to set out for a three-month visit to the Lake Tanganyika region. The authorities were unwilling to allow a single European girl to go off into the bush by herself, and so my mother accompanied me.

Bumps and Dust for 840 Miles

From Nairobi it took us more than five days to reach the Gombe Stream Game Reserve in Tanganyika, a 60-square-mile protected area set aside by the British where I would do my research. The Land-Rover was heavily overloaded, and most of the 840 miles of earth roads were in terrible condition.

Eventually, after innumerable delays, we reached Kigoma, a small European settlement overlooking Lake Tanganyika. There I hired the government launch to take us on

REDACHROME BY BARON HUGO VAN LAWICK © NATIONAL GEOGRAPHIC SOCIETY

Pressure lamp glowing as a lure, Africans off the shore of the reserve harvest sardine-size *dagaa* that they will sun-dry for market. Although the men may camp along the beach of the reserve, game law forbids their going more than 60 yards inland. Lake Tanganyika is one of the world's deepest. At one point its bottom plunges 4,708 feet, more than 2,000 feet below sea level.

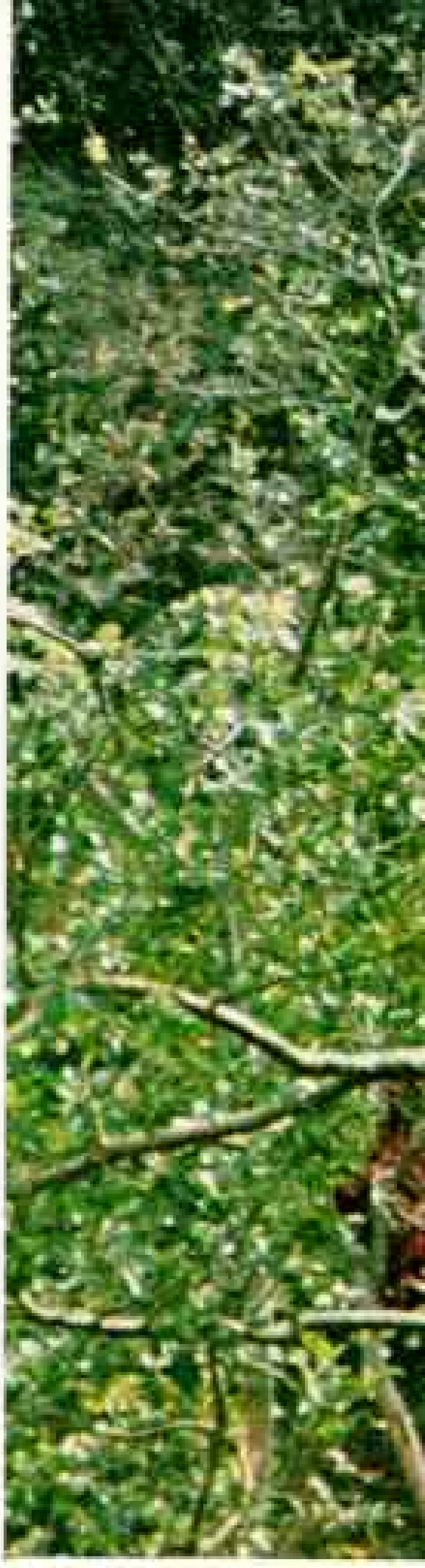
Feverish with malaria, Bantu girl carried her son six miles to visit the camp clinic set up by the author's mother (page 291).

the last stage of the journey—the 16 miles up the lake to the Gombe chimpanzee reserve.

Game Ranger David Anstey had arranged one of his semi-annual visits to the reserve to coincide with our arrival. As we traveled up the crystal-clear lake, I studied the terrain where I was to work. The mountains rise steeply from the narrow beach and are broken by innumerable valleys and gorges. The valleys are thickly forested, but the upper slopes become open woodland and many of the peaks and ridges are treeless. Most of the wild chimpanzees in Africa inhabit the dense

Alone in Ape Country, the Author Scans a Hill for Chimpanzees

Perched 1,500 feet above a precipitous valley, 29-year-old Miss Goodall sights chimpanzees afar, then moves in among them. Equipped with blanket, flashlight, tinned beans, and coffee, she often stays out alone all night to observe primate sleeping habits. She took her own picture by using a delayed exposure.



High in a treetop, four apes play follow-the-leader in an unending quest for food. This troop, dining on tender new shoots, includes an adolescent and three mature males, one of the many groupings in the constantly shifting chimpanzee society. Frequent exchanges of individuals make identification difficult, but the author's sustained observations enabled her to recognize many on sight and give them names.

rain forests of the Congo and west coast. The more open country of the Gombe Stream Reserve is ideal for field study, though the behavior of apes living there might not be the same as that of apes in the dense forests.

Our talk as we sailed the lake was about chimpanzees, and one of Ranger Anstey's stories persuaded me that they can be dangerous when cornered.

He told me of an African who decided to climb an oil-palm tree to cut down some nuts for cooking oil. A chimpanzee was high in the tree, feeding on the nuts, but the African failed to notice the animal until he had climbed well up the trunk. The ape, intent on feeding, only then saw the African, started rapidly down, and as he passed the man, hit out at him, slashing away half his cheek and one eye as he did so.

At about 2 o'clock on the afternoon of July 14, 1960, we arrived at Kasekela, a campsite midway along the 10-mile coastline of the reserve. The motor launch went back to Kigoma, with orders to return for David a few days later. We found ourselves on the beach,

HII EXTACHROME (ABOVE) AND KODACHROME BY JANE GOODALL © NATIONAL GEOGRAPHIC SOCIETY

surrounded by untidy-looking crates and bundles, together with the small boat and its outboard motor which would be our only link with civilization. Our permanent party numbered four: myself; my mother; Dominic, our African cook; and Dominic's wife.

Despair Marks First Field Studies

As we set up camp that first day, we found the heat almost intolerable, but the big tent was soon pitched and everything bundled inside. I shall always remember David's expression when he found that our only tableware consisted of a couple of tin plates, a cup without a handle, and a thermos top! Indeed, we were equipped with only the barest essentials, and I think even Dominic was secretly shocked.

During the first two months of my field studies, I often despaired. Each dawn I set out alone, following the little streams as I explored the valleys one by one, forcing my way through the dense undergrowth or scrambling up the steep slopes. Sometimes I saw a group of chimpanzees feeding in a tree, but seldom managed to get close before the shy apes moved away. Frequently I heard their noisy calling, but usually they had moved off before I could catch up with them. Disheartened, I trudged wearily back to camp each dusk.

But those early days, however frustrating, initiated me into the ways of mountain life. The forests no longer seemed hostile after I learned to creep along pig trails instead of forcing my way through the undergrowth. The slopes were no longer a nightmare when I had discovered the baboon trails where I could pull myself up the steepest parts by roots worn smooth by constant use. I became acquainted with other animals: troops of vervet and redtail monkeys; the beautiful red colobus monkey; the shy bushbuck; the fat ginger bush pig.

One morning, while walking along the lake shore, I was approached by an excited fisherman who showed me a tree into which a bull buffalo had chased him the night before. "*Huyu kali sana*," the man said. "He's a bad one, this fellow."

Indeed, the tree was scored by innumerable

Swaying dangerously high above ground, Goliath, 150-pound heavyweight of the Gombe Stream Reserve, picks leaves of the *Chlorophora excelsa*, locally called *mvule*. On them he finds favorite morsels—hard, sweet galls, the tumorlike growths of plant tissue in which young gallflies live (page 302).

Inspecting his fingertips, William relaxes in a fig tree after feeding. Less active than most wild chimpanzees, he stretches out along a branch after breakfast to avoid the bother of building a nest, although the procedure would require only minutes.

HE EXPLORER BY JANE GOODALL © NATIONAL GEOGRAPHIC SOCIETY

gashes from the buffalo's horns. Mostly, however, the small herds are wary and hard to approach.

Once I did have to climb a tree, when I met two crotchety old bulls along a narrow track. My climb to safety was speeded by memory of Dr. Leakey's opinion of them.

"I'd rather meet a rhinoceros or a lion any day. I am more frightened of the buffalo than of any other creature in Africa."

Often I saw the tracks of a leopard, or recognized its powerful feline smell, and sometimes I heard the soft rasping of its hunting call. Many months later I saw one. He passed only a few yards away in the long grass, and I felt slightly apprehensive. But when he winded me he turned silently away.

One-girl Camp Set Up Near Chimps

I never attempted to hide, and gradually the animals became used to the strange pale-skinned primate that had invaded their territory. After about six months, most of the chimpanzees would sit and look at me calmly at distances of 100 yards. At first they fled if they saw me within 500 yards.

Three-quarters of an hour's climb from camp, I discovered a peak overlooking two valleys and many open grassy ridges and slopes—an ideal place for long-distance observation. From the peak I could locate a group and then try to get closer. I had a tin trunk carried up there, with blanket, electric torch, a couple of tins of baked beans, coffee, and a kettle. When the chimps slept close by, I stayed up in the mountains near them.

So, gradually, I began to learn the basic behavior patterns of the chimpanzees, and after six months I was able to pick out and name some individuals. When I saw Mike lazing in the sun, for example, or Count Dracula ambling past, it was like meeting a friend.

People often ask me how I choose such names for individual chimpanzees. My answer is that some names—such as Mrs. Maggs, Spray, and Mr. McGregor—simply come to mind. Strange as it may sound, some chimpanzees remind me of friends or acquaintances in some gesture or manner and are named accordingly.

One chimpanzee had a pale, flesh-colored face instead of the dark color common in adults. It gave me a slightly eerie feeling when I first saw him close to, and ever after that he was "Count Dracula."

Study Extended by Society Grant

When the three preliminary months came to an end, the National Geographic Society took over sponsorship of my research and financed a further 20 months. My mother had to return to England, but by then I was accepted by the authorities and so was allowed to stay on at the reserve.

At this time I was joined by Hassan, of the Kakamega tribe, an African who had worked for Dr. Leakey for 15 years—a most responsible and reliable helper. He took over the little boat and the monthly trip to Kigoma for stores and mail. The trial period was over, and I could settle down to building a closer contact with the apes.

Chimpanzees are nomadic within their territory, and they follow no fixed circuit. They have no regular sleeping trees. Most chimpanzees in the reserve—probably between 60 and 80 individuals—range, at various times of year, over the whole 60 square miles, and sometimes beyond the boundaries. The distance and direction of their wanderings—they may travel as much as eight or ten miles in a day—depend on the seasonal availability of the fruits, leaves, and blossoms that form the bulk of their diet.

The chimpanzees during much of the year move about in small groups of three to six animals. Such a group, I discovered from observation, may consist of adult males and females, of females and juveniles, of males only, or of a mixture of sexes and ages.

During the day two or three small groups may join and move about together for a few hours or a few days. In certain seasons, mainly when some kind of favorite fruit is plentiful, I have often seen as many as 25 chimpanzees together.

What makes the social pattern so complicated is that the small groups are not stable. When two groups which have joined temporarily separate again, there has frequently been an exchange of individuals. Males often leave the group they are with to move about alone, subsequently joining another group or another lone male.

This casual, free-and-easy grouping makes it harder to recognize individuals, yet it is essential to do so before one can even begin to understand the social pattern.

From my mountaintop perch, I observed how chimpanzees go to bed. Every night each one makes its own sleeping platform, or nest —except for the small infants, which sleep with their mothers until they are about three years old.

Treetops Provide Springy Mattresses

The construction of a nest, I found, is simple and takes only a couple of minutes. After choosing a suitable foundation, such as a horizontal fork with several branches growing out, the chimpanzee stands on this and bends down a number of branches from each side so that the leafy ends rest across the foundation. He holds them in place with his feet.

Finally he bends in all the little leafy twigs that project around the nest, and the bed is ready. But the chimpanzee likes his comfort, and often, after lying down for a moment, he sits up and reaches out for a handful of leafy twigs which he pops under his head or some other part of his body. Then he settles down again with obvious satisfaction.

One evening I sat quietly below a group of five chimpanzees that were feeding in a tree.

REACHING AND BE EXTENDING (LEVIN, RIGHT) BY JANE GOODALL © N.G.S.

Rainy weather routine: To escape the cold, damp ground, two mature males (above) rest among branches in freshly built day nests, but they make no effort to take shelter from the rain. In the dry season, usually from May through September, the animals prefer to nap in the shade of trees.

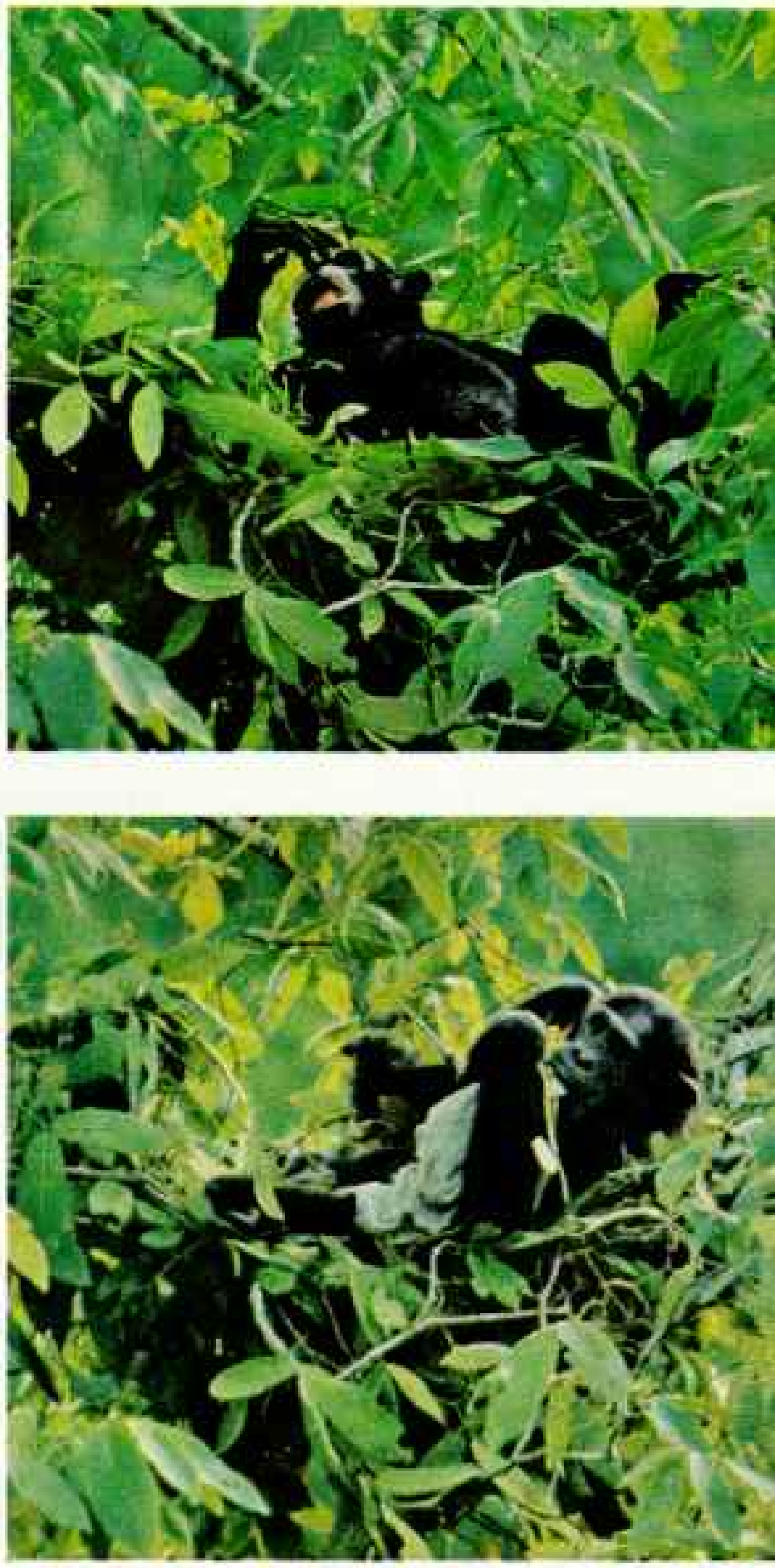
Throughout the year the primates live like nomads, ranging a territory that extends beyond the reserve boundaries. If food is in short supply, they may travel as much as 10 miles a day. At twilight the tired wanderers begin to seek lodging for the night.

Climbing into the trees, they construct new sleeping platforms, sometimes 80 feet above ground. To build a nest, each ape bends branches and twigs into a leafy covering over a fork in the tree.

Suffering with a cold, William (top, *right*) turns in early. Apes often snack at bedtime.

Nesting chimpanzee seeks solace by chewing on a towel he stole from the author.

Curled like a dog, an ape dozes. He will vary sleeping positions, but prefers the side.



There was Mrs. Maggs with her two offspring: little Jo, about two years old; and Spray, then about five. There was another mature female, Matilda, and a young male, Hugh.

Just before sunset there was excited calling as another male joined the group. Spray climbed down from the tree and ran up the slope to greet him. As they climbed the tree together, I saw that the newcomer was Mr. McGregor, an old male who had lost the hair from his shoulders and was almost completely bald-headed—a rarity in chimpanzees.

The group fed quietly until the sun had almost vanished behind the mountains across the lake, and then Mrs. Maggs began looking for a place to make her nest. She tested the branches exactly the way a person tests the springs of a hotel bed. One by one, the other apes began to make their nests.

Drowsy Mother Cuddles Little One

When the sun finally sank out of sight, Mrs. Maggs was lying on her back in her completed nest. As the chill of night crept into the air, little Jo ran to her mother, who put out her arm and drew the young one close to the warmth of her body.

Darkness fell swiftly and I climbed to my mountaintop lookout post, opened a tin of beans, and boiled my kettle over a little fire.

In a wilderness boudoir Miss Goodall lathers her blond hair with water pure enough to drink. Sedge crowds the rocky bed of Kakombe Stream, a campside bath. Shallow rivulets course nearly all the cool, humid valleys that cut through the reserve. The author reports that chimpanzees appear to ignore lake waters, preferring to drink from streams.

The moon was nearly full, and the mountains were beautiful and rather ghostly when I returned to the chimpanzees. I disturbed them as I settled down with my blanket about 50 yards away, and they began to call out loudly, alerting a troop of baboons sleeping in the valley below. The chimpanzees soon quieted down, but the baboons went on barking for a long time.

The chimpanzees slept soundly for the rest of the night, but I was perched halfway down a steep slope with only a small tree to keep me from slithering into the ravine below. I was glad for the first glimmering of dawn.

As it grew lighter I gradually made out the dark shape of Mrs. Maggs, with Jo curled up beside her. Soon Jo sat up, yawned, and gazed about. Mrs. Maggs rolled over onto her back, flung out an arm, and also yawned. Jo jumped onto her chest, leaned forward, and pressed her face against her mother's, flinging her arms around her neck.

Chimps Awake in Mood for Fun

The other apes began to move. I could see Matilda sitting up in her nest and Spray feeding in a tree close by.

Jo became restless. She climbed to a branch above the nest and hung down, kicking and twisting from side to side. Her mother reached

ACHACHROMES BY KARUN HUGO AND LARUS © NATIONAL GEOGRAPHIC SOCIETY

Balky outboard plagues the author on 420-mile-long Lake Tanganyika, her only route back to civilization. Storms sometimes send boats scurrying for shore.

BOOKGROUNDS BY BARON HUGO VAN LAWICK (ABOVE) AND YVONNE MORRIS-KUCHEL © N.G.S.

Confirmed banana raider makes a getaway, unmolested by lunching Africans. Enjoying the ruin of camp, chimpanzees carry away blankets and clothing as well. David Greybeard, boldest and friendliest of the apes that visit the author, often enters tents, peers under beds, pulls out clothing, and pokes through boxes to find hidden fruit.

In friendly persuasion, David nudges a restraining arm, hoping to get at bananas in a hinged box, the camp's only chimp-proof storage. Wild chimpanzees are normally gentle; this contrasts with the dangerously bad tempers many males develop in captivity.

up and patted her, pushing her to and fro, until Jo, delighted, tumbled down on top of her. Mrs. Maggs, her legs in the air, bounced Jo up and down with her feet and then suddenly bent her knees so that Jo collapsed in a heap of waving arms and legs.

The game went on for about ten minutes; then Mrs. Maggs suddenly sat up and peered down through the branches. Matilda had left her nest, and sounds below indicated that the others were moving away. Mrs. Maggs touched Jo, who jumped to her at once, clinging under her belly as the mother swung down from the tree.

When a chimpanzee is born, it is almost as helpless as a human baby, save that it rapidly develops great strength in hands and feet, enabling it to cling to its mother's long hair as she travels from place to place.

For the first four months the infant never leaves its mother, but after this it begins to venture first a few feet and then a few yards away. It is still very unsure of itself, and the mother is always ready to reach out should it lose its balance.

Babies Play Like Human Children

By the time the infant is about a year old, it has more confidence and spends hours playing gently, hanging from a branch and patting at its toes, or doing careful gymnastics on a branch. If two infants play together, they pat out at each other or have a tug-of-war with a twig. Always the games are slow and gentle.

By the time they are about two years old, the little apes are very active and their playing far more adventurous. Whether they are swinging and leaping around in a tree or rolling over and over on the ground, they never seem to be still for a minute.

Their elders, particularly the adolescents and the younger males, are amazingly good-natured with them. I once watched little Fifi tormenting an adolescent male, Figan. He was resting peacefully when Fifi hurled herself onto him, pulling his hair, pushing her fingers into his face, biting his ears. She swung above him, kicking out, while he indulgently pushed her to and fro with one hand. Finally, exhausted for the moment, she flung herself down beside him.

From the age of about three years the young chimpanzee becomes more and more independent. Often it still moves around with its mother until it is five or six, but it no longer rides on her back or sleeps in the nest with her at night. Games become rougher and wilder, wrestling and chasing being the favorite sports.

Occasionally a small infant tries to join in,

Foil-wrapped baubles adorn a tropical Christmas tree. Balloons festoon the tent; baboon skull, found and studied by the author, tops the pole. Goliath, who nested the night before almost overhead, chooses a banana but disdains oranges. Palm-nut tree beyond the tent provides a chimpanzee staple.

and then the older ones treat it with great consideration. I saw one youngster swinging an infant gently by one arm and then, after peering down, she dropped the little one to a leafy platform a few feet below. When the infant had difficulty in climbing up again, she gave a helping hand.

At about eight years, the chimpanzee child attains puberty, and during the next three or four years of adolescence it gradually takes its place in adult society. How long it might live, no one can say pending further study, but a good guess for average life span in the wild would be 40 to 50 years.

Chimps Express Feelings in Action

In this society, relationships among the adult apes are more harmonious than had been assumed from observations of chimpanzees in captivity. Of course, if you judged from sound alone, you would imagine that wild chimpanzees were always fighting and quarreling. When two groups meet there is sometimes a fantastic cacophony as the males call loudly, drum on tree trunks, and shake branches, while the females and youngsters scream and rush out of the way. But this is merely excitement and pleasure; with his highly emotional extrovert temperament, the chimpanzee likes to express his feelings in action.

When squabbles do arise, often over the merest triviality, they are usually settled by gestures and loud protest. Once I was watching a youngster feeding peacefully beside an adult male. By chance, they both reached for the same fruit. The youngster immediately withdrew its hand, but screamed loudly and "flapped out" at the male. The male screamed and flapped at the youngster. This went on for a few moments and then the quarrel ended, neither ape having touched the other.

Relationships between mature and adolescent males are particularly harmonious—they do not even fight over females! I once saw seven males in succession mate with a single female, with no sign of jealousy or antagonism.

As to mating in general, chimpanzees in captivity breed all year round, and it seems likely that this is the case in the wild, because females appear receptive toward males during all months of the year. In addition, I saw small infants in April, June, September, and October.

During September and October, however, when the chimpanzees are frequently seen moving about in large aggregations, excitement, caused by this social stimulation, does appear to have a very marked effect upon reproductive behavior. I saw the animals mating almost daily during these two months—spring in Tanganyika. Thus, although it would appear that a certain amount of mating must take place throughout the year, there is, apparently, a very definite mating season.

Mutual grooming plays an important part in the social life of chimpanzees, and two friends, or even a small group, will sit quietly for hours searching through each other's long black hair for specks of dirt, grass seeds, or ticks.

Some students of animal behavior see in this grooming activity the first beginnings of true social and altruistic behavior in the whole animal kingdom.

Calls and Gestures Serve as Language

I am often asked, "Do chimpanzees have a language?" They do not, of course, have a language that can be compared with our own, but they do have a tremendous variety of calls, each one induced by a different emotion.

The calls range from the rather low-pitched "hoo" of greeting, and the series of low grunts that is heard when a chimpanzee begins to feed on some desirable food, to the loud, excited calls and screams which occur when two groups meet.

One call, given in defiance of a possible predator, or when a chimpanzee, for some reason, is angry at the approach of another, can be described as a loud "wraaaah." This is a single syllable, several times repeated, and is one of the most savage and spine-chilling sounds of the African forest.

Another characteristic call is a series of hoots, the breath drawn in audibly after each

Lower lip stuffed. David Greybeard interrupts his dinner in camp to listen to the call of chimpanzees nearby. He sits in a relaxed position, forearm on knee, elongated hand dangling. Tough, thickened skin on the knuckles attests the four-legged gait preferred by the apes. Divergent big toe, useful for gripping, helps him climb trees. White whiskers are no indicator of age; they often sprout on youngsters.

Sick call at camp finds the author's mother,

"**Open wide,**" comes the order and a chronic complainer swallows cough syrup. A fisherman's son of the Bantu Waha tribe, Jamanne dreams up a new ailment almost daily to get attention. Africans walk as far as 10 miles to obtain medicine.

hoot, and ending with three or four roars. This is the cry of a male chimpanzee as he crosses a ridge. It seems to be an announcement to any other chimpanzees that may be in the valley below: "Here I come."

These calls, while they are not a language in our sense of the word, are understood by other chimpanzees and certainly form a means of communication.

In addition, chimpanzees communicate by touch or gesture. A mother touches her young one when she is about to move away, or taps on the trunk when she wants it to come down from a tree. When a chimpanzee is anxious for a share of some delicacy, he begs, holding out his hand palm up, exactly as we do. He may pat the branch beside him if he wants a companion to join him there. When two animals are grooming each other and one feels that it is his turn to be groomed, he often reaches out and gives his companion a poke.

Once, when three males were all grooming one another, I saw a female going round poking at each of them in turn. But she was completely ignored—and so sat down sadly and groomed herself!

There are also many gestures of greeting and friendship. Sometimes when two friends meet after a separation, they fling their arms around each other in a delighted embrace.

Mrs. Vanne Morris-Goodall, dispensing aspirin

Indulging a passion for chewing on cloth, David absconds with the cook's blanket. To win the apes' friendship, the author instructs her assistants to let them take whatever they want, never to chase them—so they won't feel angry or frustrated.

Despite this fairly well-developed system of communication, a chimpanzee suddenly confronted with danger gives no alarm call to warn his companions, but simply runs off silently.

Defiant Glares Greet Visitor

This was the way the apes initially reacted to my presence, but after a few months fear gave place to curiosity. Curiosity, in turn, changed to defiance. Then, instead of running away or peering suspiciously at me, some of the chimpanzees would climb into the trees and rock the branches, glaring at me in silence.

Those silent "displays," as modern scien-

tific zoologists call them, were still tinged by fear, and it was many months before the chimpanzees were sufficiently unafraid to react with real aggression. It happened for the first time when I was following a group in thick forest. The chimpanzees had stopped calling when they heard my approach, and I paused to listen, unsure of their whereabouts.

A branch snapped in the undergrowth right beside me, and then I saw a juvenile sitting silently in a tree almost overhead, with two females nearby. I was right in among the apes. I sat down. Then I heard a low "huh" from a tangle of lianas to my right, but I could see nothing. Then came another "huh" behind me, and another in front.

Curiosity Prompts an Attack

For about 10 minutes these uneasy calls continued. Occasionally I made out a dark shape in the undergrowth, or saw a black hand clutching a liana, or a pair of eyes glaring from beneath black, beetling brows.

The calls grew louder, and all at once a tremendous bedlam broke out—loud, savage yells that raised the hair on the back of my neck. I saw six large males, and they became more and more excited, shaking branches and snapping off twigs. One climbed a small sapling right beside me and, all his hair standing on end, swayed the tree backward and forward until it seemed he must land on top of me. Then, quite suddenly, the display was over and the males began to feed quietly beside the females and youngsters.

On one occasion I was actually hit by a chimpanzee in the wild, but this was prompted by curiosity rather than aggression.

I was waiting near a ripe fruit tree when I heard footsteps in the leaves behind me. Not wanting to startle the apes, I lay down, hoping that they would reach the fruit tree without seeing me. But the footsteps stopped, and I heard small, high-pitched sounds behind me: "Hoo! Hoo!" The inflection told me the chimpanzees were surprised or uneasy.

I did not move, and suddenly a mature male climbed into the tree above me and sat, scarcely 10 feet over my head, peering down at the strange object below. I think he was

Cooperative endeavor to chew up a cardboard box belies a common notion that a dominant male always drives away lesser competitors. Meeting in the wild, large groups call loudly, screaming with excitement and drumming on trees, but mingle without fighting. Here Goliath stands while William (left) munches and David ponders a bite.

BOOKMARKING BY JANE GOODALL © NATIONAL GEOGRAPHIC SOCIETY

Camp raider proves a scientific point. Walking erect, banana-loaded David dispels the belief that chimpanzees travel on all fours except when running. Even with arms empty, the animals sometimes assume an upright stance, the better to see over surrounding vegetation. The author observed chimpanzees loading their arms with choice wild fruit, then walking erect for several yards to a spot of shade before sitting down to eat.

puzzled by my immobility and by the sheet of polyethylene protecting me from the rain.

He worked himself into a rage, hitting the trunk and shaking the branches. His small hoots became louder until, with mouth wide open to show yellow canines, he was uttering high-pitched, choking screams of anger.

Still I did not move. Through the corner of my eye I could see three others watching.

All at once the male disappeared, and I heard him moving in the leaves behind me. There was a silence and then, with a loud scream, he rushed forward and I felt the slam of his hand on the back of my head.

The experiment had gone far enough—the fate of the African who had lost an eye and half his cheek in an encounter with an angry chimpanzee came to mind. Slowly I sat up, and at last the ape realized exactly what I was. He moved away with his companions, still brave from his passion, calling out and drumming on the trees.

Later I talked with Dr. Leakey about the incident—and was thankful I had made no sudden moves or cries that would have further enraged the chimpanzee.

"If you had waved your arms, shouted, or shown anger in any way," he said, "you might have been killed. He was merely testing to find out if you were an enemy or not."

Gradually, during the months of my study, the apes became less aggressive, until finally I was greeted almost as another chimpanzee —sometimes by a show of excitement with hooting and shaking of branches, and sometimes by a complete lack of interest.

On the whole the chimpanzees merely tolerated me, but one, a mature male in the prime of life, went a stage further, and tolerance became friendship. David Greybeard—he deserves an article to himself.

It was during the eighth month of my research, when the fruit was ripe on one of the oil palms outside my tent, that David paid his first visit to camp. Dominic told me about it when I got down from the mountains that April evening.

The following day I learned he had called again, and so I determined to wait in camp to try to see him. I recognized him at once from having seen him in the forest; he had always been particularly unafraid of me there.

He visited camp almost every day for about a week, and then the nuts were finished and he stopped coming.

David Provides a Wonderful Moment

When more palm nuts ripened, however, David again visited us. Even in those early days he sat feeding calmly while I walked about under the trees. I discovered that he liked bananas too and left a few out for him.

Gradually he became tamer and tamer, but it was not until the last five months that David showed complete confidence in his human friend. Two of the palms in camp were ripe, so I got in a great supply of bananas and devoted myself to David for a whole week.

After three days he actually took a banana from my hand. It was a wonderful moment. He was apprehensive when I held it out. He stood up and hit the trunk of a tree, rocking slightly from foot to foot. But when he took the fruit there was no snatching—he was amazingly gentle from the first.

Friends in the Forest, Too

After that I began carrying a couple of bananas with me up in the mountains, and when I met David he would come up and take them, sitting close beside me, to the astonishment of his companions who gazed wide-eyed at the behavior of their fellow ape! Even when I had no bananas David would come to sit beside me for a moment, with a soft "hoo!" of greeting.

Soon David began popping into camp any old day, whether there was a palm with fruit or not. Dominic and Hassan were both delighted and would describe David's visits in detail when I returned from the mountains in the evenings.

Best of all, David began to bring two friends along, Goliath and William. At first they were shy and watched from the safety of the trees, but eventually the sight of David sitting and

Balancing in a Tree, Apes Groom Each Other

Remarkably free of fleas, these chimps pick out seeds, dirt, burrs, and ticks. Among adults, mutual grooming takes as much as two hours of leisure time daily.

With bored tolerance, David endures grooming by the author. Discarded banana peels evidence his growing sophistication. When first offered the fruit, he devoured skins and all. Now he drops peelings—but often guards them jealously.

KODACHROMES BY JANE GOODALL (ABOVE) AND BARRIE BOURNE-GOODALL © NATIONAL GEOGRAPHIC SOCIETY

Finicky about his feet, a chimpanzee leaps a stream to keep them dry. The apes dislike stepping into water and sometimes swing through trees to avoid it.

stuffing himself was too much for them, and they rushed out to grab a share of the bananas. Ultimately they became as tame as David, and I was able to treat the three in a way few people would care to treat a mature chimpanzee in captivity.

Clothes and Blankets Disappear

In addition to their love for bananas, David and his friends had a passion for sucking material—old clothes and greasy cloths from the kitchen were the most sought after. David went off with a good many blankets, as well as shirts and other garments, and Goliath took many tea towels, but it was William who was the real thief.

William looked for things to steal, and Dominic, as soon as he saw him approach, would rush off to protect the washing and watch over the tents.

But there were many days when William's arrival went unnoticed, and finally my wardrobe was reduced to one pair of shorts and two shirts. All my blankets had, at some time or another, been rescued from the trees where William had abandoned them.

Chimpanzees show as much individuality as man himself, and David, Goliath, and Wil-

KODACHROME BY JANE GOODALL © NATIONAL GEOGRAPHIC SOCIETY

Shoulders hunched and lower lip drooping, timid William emerges from five-foot-high sword grass. Dense growth, soaked by an average of 40 inches of rain, springs to 12 feet or more during the months-long wet season. In pursuit of ape troops, Miss Goodall must push her way through such knife-edged stands, sometimes taking to trees as do the animals she tracks. "I'm becoming more and more arboreal," she says.

liam have very different characters. David has an exceptionally calm disposition and an air of natural dignity. He takes life as it comes, moving leisurely from place to place, and is always trying to calm the excitable Goliath.

Goliath, with his massive shoulders and bull neck, could easily be taken for a gorilla at first glance. He is wild, impetuous, and inclined to violence; all his movements are vigorous, whether he is swinging down from a tree or charging off to meet a friend.

His large size and uncertain temper make him well respected by the other chimpanzees. When he leaps into a tree to join a group, there are wild screams as the hitherto peaceful chimpanzees scatter in all directions. He is the only male I have seen actually attacking a female, and on one occasion he even drove a young ape from its nest, which he then appropriated, bending in a few more branches and settling down with great satisfaction.

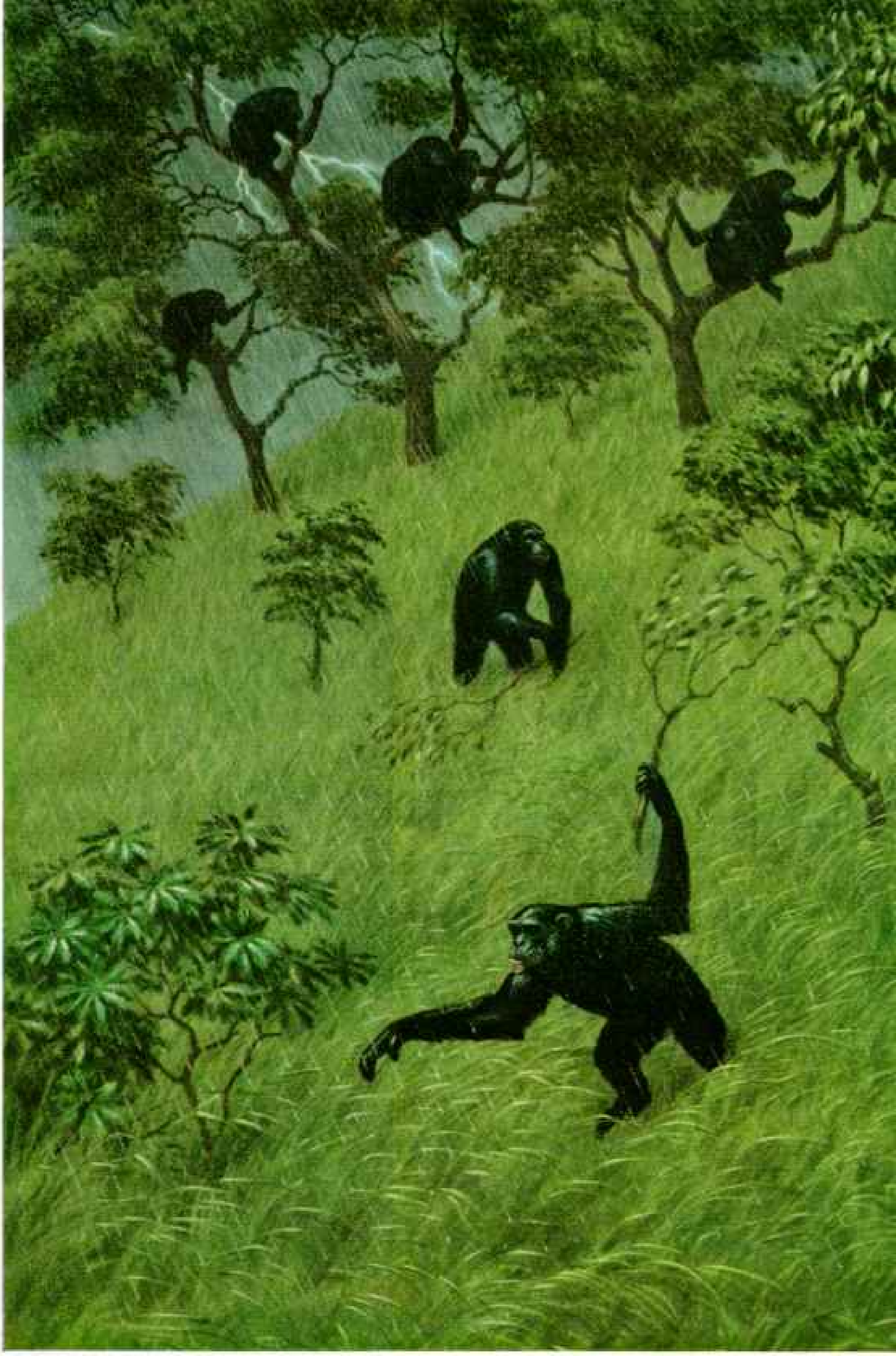
Angry Goliath Brandishes Ax

When I refused to give Goliath more bananas, he became tremendously excited and rushed about slapping the ground or tearing off branches and waving them in the air. Once when I withheld the fruit, he charged after Dominic's wife, seizing an ax that was lying nearby and brandishing it over his head. He probably had no intention of using it as a weapon. It was simply a means of expressing his frustration; he calmed down at once when I went up to him with a banana.

William—well, William is just William. With his long, scarred upper lip and his long, drooping lower lip he is the clown of Chimpland. Yet he is a rather pathetic individual under his clownishness. In the early days when he sat watching David eat bananas and dared not approach, he would rock himself quietly from side to side, occasionally saying sadly, "Hoo! Hoo!" Once or twice he was a little more active, rocking branches and snapping twigs, but he never gave a display like Goliath's.

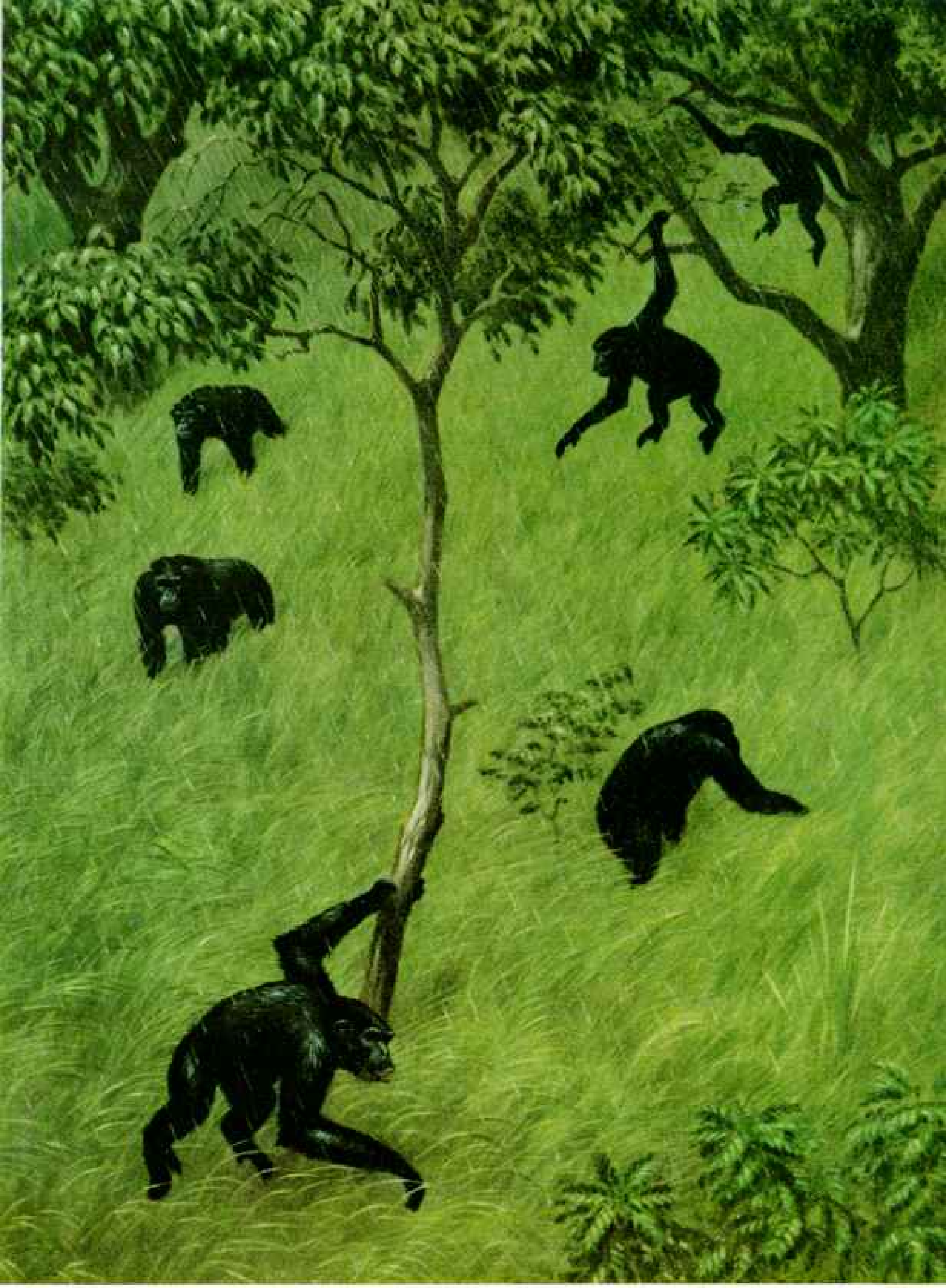
Even in health William is a sad figure, with

Disturbing sight—the crouching author—sends a big male scurrying. When startled, chimpanzees clamber from trees and race off across the ground. A more courageous ape, investigating Miss Goodall, struck her.



Leaping From Trees and Brandishing Boughs, Apes Charge Downhill in a Wild Rain Dance

Females and their young look on from safe perches while bellowing males, coats glistening in a downpour, stage a frenzied rite to the flash of lightning and the crash of thunder. Stimulated by pelting



PAINTING BY WALTER A. WEBER © NATIONAL GEOGRAPHIC SOCIETY

rain, the animals slap the ground and swat at trees as they career through the grass. One swings round a trunk to break his headlong rush. Soon he will plod up the ridge, turn, and again hurl himself diagonally down the slope. Two apes at center tense for the charge. Spectators scream with excitement. After half an hour or so, the display ends as abruptly as it began.

Prey Clamped in Teeth, a Meat-eating Ape Hurries to Cross an Exposed Ridge

Chimpanzees in the Gombe region kill game for food, Miss Goodall found, thus upsetting a widely held belief that wild chimps eat no meat. This one, uneasy in open ground, flees with the remains of a colobus monkey.

Poised for flight, a bushbuck noses a salt lick. Miss Goodall saw chimpanzees eat the young of this antelope.

his bony hips, his broken finger, his curled-up, slightly deformed feet, and his scars. Such scars and deformities are rare to my knowledge, though I have seen other broken fingers.

Once when William had a dreadful cold, he slept in the same nest for three nights, a most unusual procedure (page 283). Each night it poured rain, and when he climbed down in the morning he was shivering violently, and coughing and wheezing so that I longed to give him a hot toddy instead of a cold banana.

Chimpanzees often call out if it rains during the night. They sit up in their nests, hunched forward over their knees with heads bent down, and wait until the rain stops. I never observed them attempting to make a shelter or to take advantage of any natural one.

Rains Make Grass 12 Feet High

Rainfall in the Kigoma area is heavy, and the rainy season, which starts with the "short rains" in October, carries on without a break into the "long rains," which last until May.

At the start of the short rains, the mountains are at their most beautiful, with green grass pushing up through the black volcanic soil, and flowers, many of them exquisitely lovely, appearing overnight.

Gradually, however, it becomes hard to move through the mountains. The grass, razor sharp and always drenched by rain or dew, shoots up to 12 feet or more all over the reserve, and traveling along the overgrown tracks is no joke. Once I came within 10 yards of a bull buffalo who was lying down dozing. Luckily I was downwind and he never knew I was there.

Keeping equipment dry is a never-ending battle. Water condenses in binoculars, camera lenses mist over, and everything is permanently thick with mildew.

In addition, when I am moving about through grass taller than my head, it is difficult to see anything. In order to continue my observations, I have to climb trees. Thus, as the rainy season progresses, my own habits become increasingly arboreal!

AS SATAN PRIME (ABOVE) AND KOBACHUMI BY JANE GOODALL © NATIONAL GEOGRAPHIC SOCIETY

December brings the departure of the last of the fishermen permitted in the reserve, and my evening clinics, which consist mainly of handing out aspirin, Epsom salts, antimalaria pills, or adhesive tape to the inevitable visitors to camp, are considerably reduced. These clinics, started by my mother when we first arrived at the reserve, were a tremendous help in establishing and maintaining friendly relations with the Africans.

My most faithful patient was eight-year-old Jamanne (page 290). He always managed to think up some complaint, and was happiest when he could produce a minute scratch and demand a strip of adhesive tape. But his chief delight lay in helping me, handing out the medicine and explaining to the fishermen in the most superior manner how they should take it.

During the rains the chimpanzees tend to go to bed earlier and get up later, and when they rest during the day they often make themselves a day nest in a tree rather than lie on the cold, damp ground.

At these times infants still sleeping with their mothers at night make little nests as a sort of game, and very instructive play it is. An infant of about eighteen months finds it difficult to bend in even a couple of twigs; each time it reaches out for a second one, the first springs up again. But by the time the young one is ready to sleep alone, it has mastered the nest-making technique.

Rain Incites a Violent Ritual

Generally speaking, chimpanzees become more active during the rains and often, for no apparent reason, a male will break into a run, slapping the ground or hitting out at a low branch as he passes. This behavior, when large groups are present, may develop into a fascinating display which I have called the "rain dance."

I saw it on four occasions, always about midday and always in similar terrain. In every instance it followed the same pattern, but the duration varied from 15 to 30 minutes. It did not always take place in the rain, but rain

Dining at a forest buffet, David peels away the outer layer of a reed and munches its juicy core. Plumed plant bears the local name *ntele*.

Delicatessen item for the apes bulges from the underside of leaves. Larvae of the gall-fly cause formation of the candylike growth. Holes remain after apes pick off the galls.

was falling hard the first time I saw it.

I was watching a large group of chimpanzees, 16 in all, feeding and playing in a tree halfway up the opposite slope of a narrow ravine. Rain had been threatening all morning and finally it came down, gently at first, becoming gradually heavier.

When the rain started, the chimpanzees climbed down from the tree one by one and sat for a while on the ground before starting off up the grassy slope.

They had divided into two groups, with four large males in one group and three in the other. As they neared the ridge at the top, one of the males suddenly turned and charged diagonally downward, slapping the ground, calling loudly, and hitting at a tree as he passed. At once a male from the other group turned and began to run down the slope. Standing upright, he tore a low branch from a tree, waved it for a moment, and then dragged it behind him as he ran.

Meanwhile the females and juveniles were climbing trees near the skyline to watch.

At the top of the slope another male stood upright, rocking slightly from foot to foot, his arms swinging, working up momentum.

Bellicose Youngster Glares Down From a Fig-tree Larder

Toes gripping a slender branch, Spray stretches high to reach fruit-bearing sprigs. Thick side whiskers identify him and fellow troupers as the long-haired, or eastern, chimpanzee. This animal is about six years old.

Trees and other plants supply most of the apes' diet. They relish leaves, seeds, blossoms, stems, bark, nuts, and fruit. Resin drippings often spice the menu.

To photograph the wariest among the apes, the author crouched for hours behind a screen of leaves.

Then he too was away, charging downward, breaking off a great bough as he went. Two more set off, calling wildly. One after the other they sprang up into a tree and, without a pause, hurled themselves some 25 feet to the ground, tearing off branches as they fell and dragging them on their downward run.

At the bottom, each chimpanzee swung up into a tree to break his headlong rush. There he sat for a moment before climbing down to plod up to the top of the slope once more. Then, with loud cries, he was off again.

Thunder Roars Above Apes' Wild Calls

All the time the rain pelted down, harder and harder, while lightning streaked across the leaden sky and crashing thunder almost drowned the wild calling of the apes. Against the new green grass they looked very black and huge—like primitive, hairy men displaying their strength (painting, pages 298-9).

For about half an hour I watched; and then, as suddenly as it had started, the display was over. The spectators climbed down from their trees, and one by one the chimpanzees wandered up to the ridge and disappeared over the top. The last male paused on the skyline, looking back toward me with one hand on a tree trunk—the actor taking his final curtain. Then he, too, was gone.

Rain seems to have more effect on some chimpanzees than others. Goliath in particular often gets very excited at the start of a rain storm, and once he did a fantastic dance all by himself, swaying rhythmically from foot to foot, tearing down huge branches, and gradually becoming wilder and wilder. William, who was sitting close beside him at the start, paid absolutely no attention.

David Greybeard is inclined to become truculent in the rain. Once during a thunderstorm, when I was sitting on the banana box to try to prevent his taking all the fruit, he came and stood upright in front of me, hooting loudly, with one arm raised above his head. He then danced about, hitting a tree, the box, and finally me.

Chimps and Baboons Sometimes Clash

Occasionally a group of baboons gathers round David while he is eating bananas. Sometimes he ignores them, but often, and particularly when it is raining, he chases them off, swinging his arms and hooting.

The relationship between the chimpanzee and the baboon is complex and interesting. The ape is the larger and more powerful animal, but the baboon is far more numerous and represents the chimpanzee's only serious competitor for food.

For the most part the two species tolerate each other, and it is common to see baboon and chimpanzee feeding in the same tree. On the other hand, I have seen a group of chimpanzees leap out of a tree at the approach of a baboon troop.

On one occasion a fairly young male baboon climbed up into a palm where David and William were feeding and began to taunt William, going up to him, barking and hitting out at him. William hit back and the two fought for a moment. Then both chimpanzees climbed from the tree, leaving the baboon in possession.

Sometimes young male baboons chase after female and juvenile chimpanzees, which rush away screaming. Often one or two male chimpanzees then join in, chasing after the baboons, which flee in turn. These mock battles seem to be a strange mixture of play and aggression.

I once watched a troop of baboons teasing four adult chimpanzees—two males and two females. The male baboons insolently moved closer and closer to the apes—until, all at once, the latter seemed to lose their tempers.

The males stood upright and charged at their tormentors, swinging their arms over their heads. The females leaped to the low branches of a tree and, leaning down, screamed

Apes Fishing for Termites Use Stems as Tools, Modifying Them on the Spot

The author established that wild chimpanzees share with humans the ability to modify natural objects and turn them to useful ends—a talent long believed to set mankind apart from all other creatures.

The Gombe apes strip leaves from twigs and break off the ends when they become bent. Here one uses a twig, the other a stem of grass to probe a termite mound. Insects cling to the stems when they are withdrawn, and the chimpanzee has his dinner on a stick.

William munches termites on a bit of vine

AN EXTACHROME BY JANE GOODALL © NATIONAL GEOGRAPHIC SOCIETY

piercingly at the baboons below. I thought a real fight would take place, but after a few moments the male chimpanzees returned from the chase, and both apes and baboons walked peacefully on.

It would seem that the chimpanzee and the baboon tolerate each other because each, to some extent, has respect for the other. But these happy relations do not exist between the chimpanzee and some of his smaller neighbors.

Gombe Chimpanzees Eat Meat

It will be a surprise to many to learn that the chimpanzee in the wild has definite carnivorous tendencies. It has always been suspected by scientists that wild chimpanzees might eat an occasional lizard or small rodent, but no one thought these apes might kill fairly large animals.

As far as I can determine, the fact that they do so came to light for the first time during my research. This behavior may not be common to all races of chimpanzees in Africa, but it is certainly true of those of the Gombe Stream Reserve.

Monkeys seem to be a favorite item on the menu. I saw them eaten on four occasions, and twice I found bits of bone in the chimpanzee droppings. In addition, I once saw a young bushbuck eaten, and another time a young bush pig. Four times the prey was unidentifiable.

I saw chimpanzees eating meat several times before I actually saw them attack and kill. On that occasion the prey was a red

colobus monkey. I was watching four of these monkeys resting in a tall, leafless tree when suddenly a young chimpanzee climbed into a neighboring tree. He sat close enough to one of the monkeys to attract its attention, yet not close enough to scare it away. Meanwhile another young chimpanzee bounded up the tree in which the monkey was sitting, ran with incredible speed along the branch, leaped at the colobus, caught it with its hands, and presumably broke its neck.

Five other chimpanzees then climbed up, including a mature male. But because an adolescent had made the kill, the carcass was torn up and shared among the whole group, with no fighting or quarreling.

At other times, however, when the prey is in the possession of a mature male, there is no such sharing. The others in the group show respect. They sit as close to the male as they can, watching the meat with longing eyes, holding out their hands palm uppermost in a begging gesture.

William Pays Price for Grabbing

The reaction of the male to his suppliants varies. Let me describe the time when Huxley was eating a young bushbuck. He was clasping the carcass with one arm, and it was, incidentally, almost as big as himself! Presumably he had broken its neck, just as other chimps had killed monkeys. In his free hand Huxley held a bunch of twigs and after each mouthful of meat he ate a few leaves—for all the world like a man with a lump of cheese and a stick of celery.

Gathered close round Huxley, and all begging, were three other large males—J. B., Hollis, and William. Several times Huxley tore off a piece of meat and put it into the outstretched hand of J. B. Once Hollis begged from J. B. and was rewarded with a small bloody splinter. When a youngster of about four years held out its hand, Huxley, after a moment, very gently cuffed it on the head, but a female with a tiny infant was allowed to feed from the carcass unmolested.

The sight of this female tucking it in proved too much for poor old William, who had been begging and begging in vain. He ventured to help himself to a bite. Evidently it was one thing for the mother to share in the spoil, but quite another when William tried to join in. Huxley at once grabbed William and bit him, at which J. B. came racing down and chased the screaming William from the tree.

There was a good deal of yelling and crashing around in the undergrowth, and then the two climbed back into the tree. They sat near Huxley, who at once hit William four or five times, after which J. B. did the same.

Poor William tried neither to escape nor to retaliate. He simply sat there screaming and took his medicine. And then he reached out to touch the lips of his punishers in the gesture of appeasement, and all was peaceful again. William was not forgiven, however, to the extent of a handout.

Raw meat, though obviously a great delicacy, is only an occasional supplement to the chimpanzee's diet. Whether the apes deliberately set out to hunt for meat, or merely make kills because of opportunity, remains undetermined. I suspect the latter.

The bulk of the diet is, of course, vegetarian. I have collected 81 different types of vegetable foods eaten by chimpanzees, of which half consists of fruits, a quarter of leaves, and the remainder of seeds, blossoms, stems, and bark.

Epic Discovery Reveals a Tool-maker

In addition, however, the chimpanzees sometimes feed on insects—at certain times of the year fairly extensively. I have seen them eating termites, two species of ant, and two types of gall, a tumorlike growth on a leaf in which the young gallfly lives. And it is this method adopted by the chimpanzees for feeding on ants and termites that probably represents the most important discovery in my two years of research.

For a long time there has been heated discussion in scientific circles as to whether any primates in the wild ever modify natural objects to make tools. My chimpanzees have settled the argument once and for all. The answer is that at least some chimpanzees do.

With humanlike concentration, a chimpanzee carefully feeds a length of vine into an opening it has made. Probing the mound while the long-winged insects await good flying weather, he gets ahead of baboons and birds, which cannot join the feast until the termites swarm out of the mounds. The chimpanzee's short thumb prevents his bringing it and forefinger together in the precision grip so useful to man. As a substitute, this ape clamps the stem between thumb and side of the index finger.

Termites form a major part of the chimpanzee diet for a two-month period. The termite season starts at the beginning of the rains, when the fertile insects grow wings and are ready to leave the nest. At this time the passages are extended to the surface of the termite heap and then sealed lightly over while the insects await good flying weather. The chimpanzee is not alone in his taste for termites—the baboon in particular has a fondness for the juicy insects, but he must wait until they fly and then take his turn, together with the birds, at grabbing the termites as they leave the nest.

The chimpanzee forestalls them all. He comes along, peers at the surface of the termite heap and, where he spies one of the sealed-off entrances, scrapes away the thin layer of soil. Then he picks a straw or dried stem of grass and pokes this carefully down the hole. The termites, like miniature bulldogs, bite the straw and hang on grimly as it is gently withdrawn.

I have watched chimpanzees fish this way for two hours at a time, picking dainty morsels from the straw and munching them with delight. When they don't have much luck with one hole, they open another and try again.

As the straw becomes bent at the end, the chimpanzee breaks off the bent pieces until the tool is too short for further use. Then it is discarded and a new one picked. Sometimes a leafy twig is selected, and before this can be used the chimpanzee has to strip off the leaves.

In so doing—in modifying a natural object to make it suitable for a specific purpose—the chimpanzee has reached the first crude beginnings of tool making.

Chimps Carry Tools on Termite Search

In this respect, the chimpanzees do not always await the discovery of a termite nest before seeking a tool. I have seen them break off a twig and carry it for as far as half a mile, going from one termite hill to another, though none at the time was suitable for feeding.

It is unlikely that this practice of fishing for termites is an inborn behavior pattern. Among higher primates, behavior is found to depend more and more on learned techniques and less and less on "instincts." It seems almost certain that this method of eating termites is a social tradition, passed from ape to ape by watching and imitation. As such, it must be regarded as a crude and primitive culture.

We do not know yet if similar traditions have developed among other chimpanzee populations in Africa. The answer may throw interesting light on the spread and development of culture in early man.*

Meat in Diet Poses Question

It is equally important to find out whether capture and eating of prey is common to all chimpanzees or peculiar to those of the Gombe Stream Reserve. Perhaps this is simply a local tradition, in which case there is always the possibility that it might develop and eventually involve more elaborate hunting techniques.

At present these chimpanzees appear merely to take advantage of any good opportunity that presents itself for the killing of prey—as was perhaps the case with early man. It seems important that in the future recurring observations should be made of the meat-eating and hunting behavior of this chimpanzee population.

In the chimpanzee, there is reason to speculate that overspecialization has not led to an evolutionary dead end, as may be the case with the other great apes. Of course, if the forests of Africa were cleared for agriculture, the chimpanzee would not survive in competition with man. But if the forests gradually disappeared due to changing climate or similar causes, I think it is interesting to conjecture that the chimpanzee, with his primitive hunting and tool-using, might have a chance of survival, a chance of adapting himself to the new conditions.

There is still much to learn about the behavior of the free-ranging chimpanzee. I am returning to the Gombe Stream Reserve for a further six months, again with the generous support of the National Geographic Society. After that I hope to make behavior studies in other parts of Africa, because, until we have sufficient comparative data, we cannot tell if the behavior of the Gombe Stream chimpanzees differs from those in other regions. Only after we have such data can we draw far-reaching conclusions about the way of life of the chimpanzee, which with the other great apes is the most nearly human of all the animals inhabiting the earth today.

*See, in NATIONAL GEOGRAPHIC, "Finding the World's Earliest Man," September, 1960, and "Adventures in the Search for Man," January, 1963, both by L. S. B. Leakey.

Katmandu, Nepal

By Cable

THE NATIONAL GEOGRAPHIC SOCIETY's familiar blue, brown, and green flag, which has been carried to both Poles, into orbit in space, and far into the ocean depths, has now twice flown from earth's highest point—the snowy crown of Everest.

Big Jim Whittaker of Redmond, Washington, first carried it to the mountain's 29,028-foot summit on May 1, 1963. Painstakingly tying the banner to his ice ax, Whittaker lifted it aloft in the measured slow motion common to oxygen-starved men at high altitudes. It was Whittaker's tribute to your Society for its vital support of the American Mount Everest Expedition under the brilliant leadership of Norman G. Dyhrenfurth of Santa Monica, California.

Three weeks later, on May 22, two more teams conquered the mountain monarch. Barry Bishop of Bethesda, Maryland, a member of the Society's foreign staff, and Luther Jerstad of Eugene, Oregon, reached the top. While violent winds tore at the flag, Bishop raised it in his own salute to the Society's three and a half million members, and to his teammates whose selfless dedication had helped him to the summit.

That same day William Unsoeld, of Corvallis, Oregon, Deputy Peace Corps Representative for Nepal, and Thomas Hornbein, San Diego, California, physician, reached the crest up the never-before-climbed West Ridge. A summit rendezvous of the two teams had been planned, and for 45 minutes Bishop and Jerstad remained atop the peak, making scientific observations and photographs, and straining for a glimpse of the West Ridge team. But no one appeared—and finally Bishop and Jerstad started down, racing the fast-approaching darkness.

As they reached a point below the south summit they heard shouts from above. Unsoeld and Hornbein had traversed the crest and were groping down the Southeast Ridge in deepening dusk. The temperature fell, and both Bishop and Jerstad felt their toes go numb. Still they waited two hours, shouting to guide the others down.

At about 9:30 Unsoeld and Hornbein emerged from cavelike dark. There was not time for celebration. The four men groped down the precipitous ice ridge seeking the safety of Camp VI. Oxygen supplies long since exhausted, all four were panting hard. Two more hours, and they could descend no farther in darkness. They faced the ultimate terror of high-altitude mountaineering—a night in the open without protection.

There at 28,000 feet, it seemed that mountain and elements had combined forces in a last savage effort to turn victory into defeat. Finding a small rock outcropping, the climbers huddled to conserve body heat. Suddenly, almost miraculously, the wind died, and an unprecedented calm lasted the night.

"Had there been wind," Barry told me, "I would not be talking to you now."

The temperature leveled off at 18° below zero. By morning, Bishop's and Unsoeld's toes and parts of their feet and finger tips were frozen hard. Some

Atop Everest's snow-packed crest, Barry C. Bishop holds Geographic flag beneath Old Glory.


NATIONAL
GEOGRAPHIC
SOCIETY

The six men who conquered Everest

James W. Whittaker, first American to attain the top

Thomas F. Hornbein and William F. Unsoeld pioneered the new West Ridge route and made the first traverse of Everest.

Nawang Gombu, a Sherpa, shared Whittaker's honors.

Luther G. Jerstad and Barry C. Bishop, a Geographic glaciologist and staff member, met the West Ridge team near the summit.

Norman G. Dyhrenfurth, of California, led the expedition. It gave scientists unprecedented opportunity to study men under stress and to investigate solar radiation, glaciology, and geology at extreme altitudes.

of Jerstad's toes were frozen, but Hornbein escaped injury.

The descent was fantastically fast. The climbers spent the next night at Camp II, 20,200 feet, and reached the expedition's Base Camp, at 17,650 feet, the following day.

Leader Dyhrenfurth radioed Katmandu for a helicopter. Through the assistance of United States Ambassador Henry E. Stebbins and officials of the USAID Mission to Nepal, the only available craft was sent for the injured men, who had been carried on the backs of Sherpas to lower altitude. The helicopter churned off into the gray Nepalese dawn on May 27. Four hours later it returned to Katmandu's United Mission Hospital, where Bishop's and Unsoeld's wives kept anxious vigil.

Two days later I arrived in Katmandu with Dr. Eldred Mundth, frostbite specialist from the National Naval Medical Center in Bethesda, Maryland, who brought a new drug. Both Bishop and Unsoeld have responded well to initial treatment.

Sunday, June 9, expedition leader Dyhrenfurth led the rest of his gallant company into Katmandu to a joyous reception.

Barry Bishop has spent his days in hospital working on the story of the great climb. Illustrated with some of the most remarkable mountain photographs ever made, it will appear in the October GEOGRAPHIC.

Last night in the hospital I asked Barry what had carried him up that tortuous slope to final victory.

"Desire, I guess, and determination," he smiled. "I'd have crawled on hands and knees to put the Society's flag beside Old Glory where Jim Whittaker had left it snapping in the gale."

I found it easy to believe. THE END

GENIUS OF LAUGHTER AND LEARNING

Walt Disney

WHEN FUTURE HISTORIANS sit down to choose a Hall of Fame for our time, there will be trouble over the name of Walt Disney.

Some judges will list him as an artist; others will call him an educator. Still others may insist that Disney belongs with the inventors, and some will argue that he was a naturalist.

Each, in my view, will have a point, for Walt Disney is all these things. But on one question the historians are bound to agree: Walter Elias Disney was a genius who brought laughter and knowledge to the world in a distinctive American way.

No country ever had such a corps of goodwill ambassadors as Mickey Mouse, the veteran trouper of 35 years; Donald, the irascible duck; Snow White and her delightful dwarfs; and Pluto the pup. Wherever they and their companions go—and there is scarcely a country that has not welcomed them—they bring laughter and enduring friendship.

Hard on the heels of Walt's antic cartoon animals came other, more serious stars—the beguiling beavers and otters of *In Beaver Valley*, the seals of *Seal Island*, the African lion, Perri the squirrel—actors not merely drawn but *taken* from life. Walt is a superb teacher of natural history, geography, and history. Disney's television characters, Davy Crockett and Johnny Shiloh, subtly taught history as they entertained.

I recently glimpsed the restless brilliance that drives Walt Disney to venture constantly into the new and the untried. We stood in one of his studios, and there Walt introduced me to Abraham Lincoln.

Unbelievably, the President put out his hand and gave me a warm handshake, as if he were receiving at the White House. Lincoln's eyes met mine, his lips moved, and I was greeted with a deep "How do you do?" and a slight bow. It was a startling, even an eerie, experience. I almost had doubts that this was only an electronically operated effigy.

Remembering how my deaf Grandmother Bell "heard" by reading the lips, I asked Walt how closely Lincoln's mouth actually shaped the words I had heard. For answer Walt turned to an assistant.

"Hear that? A great idea! Find someone who reads lips to tell us how good Lincoln's mouth is. I want him perfect!"

That was typical of Walt Disney. He seizes ideas and runs with them. Even Disneyland began this way.

"Like every father, I used to take my children to an amusement park," he told me, "and I'd be bored to death. Nothing for me to do. And I'd think, why doesn't someone develop a park where the parent can enjoy himself with the children?"

Millions of other parents must have had the same thought. The difference is, Walt Disney did something about it. He dreamed of an amusement park where family groups—children, parents, and grandparents—could go and have fun together, and then he built it. And as everyone knows, the lure of Disneyland now reaches even to Moscow.

How highly Walt Disney is regarded by his fellow Americans was indicated last March when he received the George Washington medal, highest award of the Freedoms Foundation at Valley Forge. Former President Eisenhower, serving as Chairman of the Foundation's Board of Directors, made the presentation. He read a citation honoring:

"Walt Disney, Ambassador of Freedom for the U. S. A. . . .

"For his unfailing professional devotion to the things which matter most—human dignity and personal responsibility.

"For masterful, creative leadership in communicating the hopes and aspirations of our free society to the far corners of the planet."

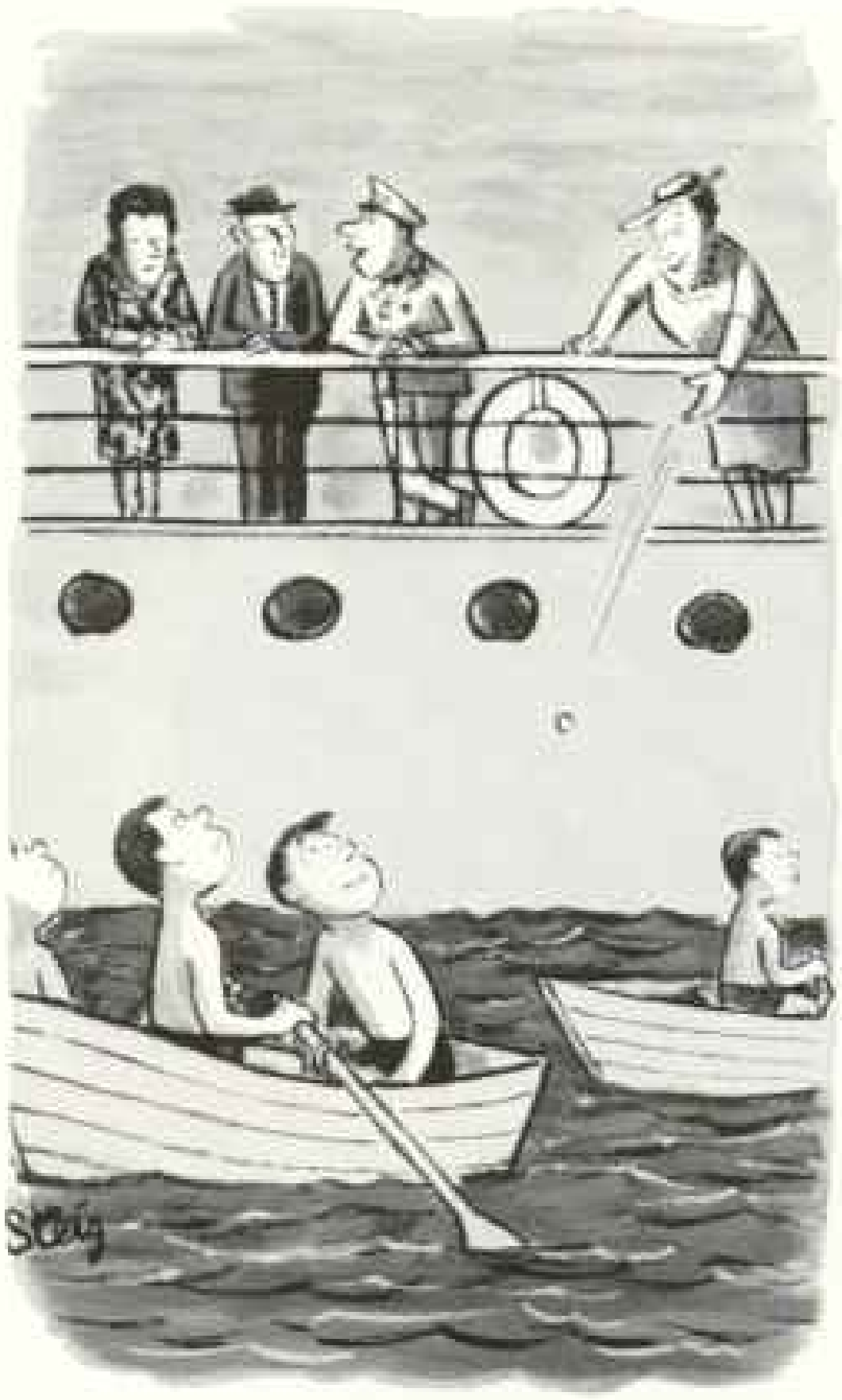
Mabel Bell Grosvenor

EDITOR

Moving 45 tons at 550 miles per hour is routine for today's mighty jet transports. These transoceanic Boeing, Douglas, and Lockheed sky freighters are powered by Pratt & Whitney Aircraft's modern JT3D turbofan engines. Pratt & Whitney Aircraft provides design and manufacturing leadership in power for many applications, in and out of this world.

Pratt & Whitney Aircraft

U
A



"They only dive for
First National City Travelers Checks
—they're better than money."

Why should the divers—or you—settle for less than FNCB Travelers Checks? They're better than money because you can get an on-the-spot refund if they're lost or stolen. You'll get a prompt refund through any of FNCB's global network of thousands of refund agents. They are spendable anywhere—here and abroad—but only by you. And they are backed by First National City, best-known name in world-wide banking. Ask for them by name at your bank.

Fastest refund in case of loss or theft—
In U.S. except Alaska and Hawaii, phone WESTERN UNION OPERATOR 25 for nearest refund location. In other countries, Alaska and Hawaii, inquire at principal hotels.

FIRST NATIONAL CITY BANK
TRAVELERS CHECKS
Member Federal Deposit Insurance Corporation

Love Letters to Rambler

Walter Barnum

Retired Executive Walter Barnum of Old Lyme, Conn., has driven many cars "on towards two million miles in New York, London and Paris." His Rambler is a smart 250-hp V-8 Ambassador Sedan and he writes enthusiastically about it . . .

"Quite out of this world for anything like that price"

"My new Rambler...it's superb! I get a kick every time I take (it) out.

"I don't need to tell you about the brightness and flash of the engine. (It's) very powerful and has smooth brakes to match.

"I'm naturally a bug on steering gears...(and this)... is the finest I've ever handled.

"Incidentally, all the details for comfort and convenience such as ventilation, heating, lighting, etc., are direct, intelligent and practical.

"...there is nothing on the road that can compare with it at anywhere near the price, and for the preponderant majority of users, at any price."

And no other car—at any price—gives you a '63 Rambler's tougher, tighter, more rattleproof Advanced Unit Construction—or the protection of Deep-Dip rustproofing right up to the roofline.

Check over these Rambler exclusives —and all the other "Car of the Year" features—at your Rambler dealer!

WHAT THEY'RE SAYING ABOUT THE CURRENT BEST SELLER MEN SHIPS AND THE SEA

"A salty literary feast."

Edouard A. Stackpole
CURATOR
MARINE HISTORICAL ASSOCIATION
MYSTIC, CONNECTICUT

"A stunningly beautiful book . . . an accomplishment you should deservedly be proud of!"

Lionel Casson
PROFESSOR OF CLASSICS
NEW YORK UNIVERSITY
NEW YORK, N.Y.

"An extremely useful work of reference for permanent inclusion in any nautical library worth the name."

Frank G. G. Carr, C. B. E.
DIRECTOR
NATIONAL MARITIME MUSEUM
GREENWICH, ENGLAND

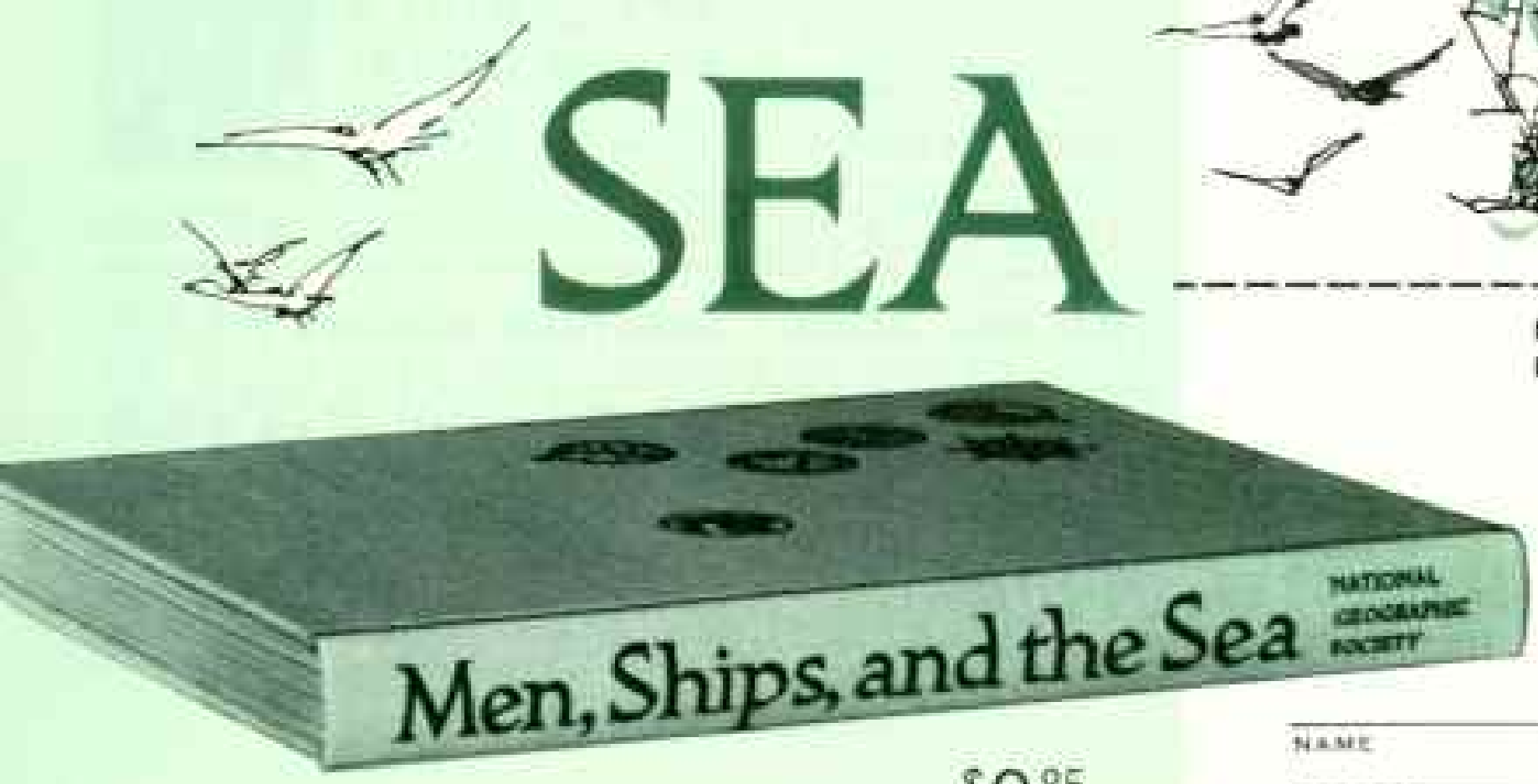
"I know your readers throughout the world will treasure this outstanding publication."

E. M. Eller
DIRECTOR OF NAVAL HISTORY
DEPARTMENT OF THE NAVY
WASHINGTON, D.C.

"It is a book that every lover of the sea will want . . ."

Richard H. Randall
MARYLAND HISTORICAL SOCIETY
BALTIMORE, MARYLAND

YOU'LL SAY:
it's one of the best books you ever owned. Order it today—start enjoying it soon!



$9.85 POSTPAID

NATIONAL GEOGRAPHIC SOCIETY
Department 122, Washington 36, D.C.

Enclosed is remittance of
$_____ for _____ copies of
MEN, SHIPS, AND THE SEA.
Send free catalog of all
Geographic publications ☐

NAME _____

ADDRESS _____

CITY, ZONE, STATE _____

Home Study

CALVERT SCHOOL If you plan to live abroad, you can educate your child with approved Calvert home-study course, Kindergarten—8th grade. Step-by-step teaching manual. Used by thousands. Ideal for superior child. Non-profit. 38th year. Catalog. **18 E. Tuscany Road, Baltimore 10, Maryland.**

Coed Schools

FENSTER RANCH SCHOOL Fully accredited ranch school for boys and girls. Grades 1–12. College preparatory. Superior facilities, staff. Riding, swimming, other activities in warm, dry climate. Catalog. **Mr. G. D. Fenster, Director, P.O. Box 6238, Tucson, Arizona.**

JUDSON SCHOOL Coed Ranch School. Grades 1–12 (boarding 5–12). College preparatory. Healthful, warm climate, near Phoenix. Small classes. Accredited. Riding included in tuition. Tennis, swimming, rock gym, riflery, music. 25th yr. Catalog. **David N. Wiek, Headmaster, Scottsdale, Ariz.**

Vocational

KATHARINE GIBBS Outstanding secretarial training for high school, private school graduates. Special course for college women. Resident facilities. Catalog. **Asst. Dean, 71 Marlborough St., Boston 16, Mass.; 200 Park Avenue, New York 17; Montclair, N.J.; 155 Angell St., Providence 6.**

Girls' Schools

KINGSWOOD-CRANBROOK Day, grades 7–12. Boarding, grades 9–12. Thorough college preparation. Unusual opportunities in wrestling, other arts, sciences, music, sports. 50-acre campus. Descriptive literature on request. **885 Cranbrook, Box 155, Bloomfield Hills, Mich.**

College for Men

LEICESTER Two-year College for Men. A. & S. Degree. Thorough Business Administration prepares for success at management levels. Majors in Accounting, Adv. Management, Merchandising, Lib. Arts. Transfer or terminal. Vocational graduate. Suburban campus. Sports. **Dir. of Admissions, Leicester 1, Mass.**

Boys' Schools

AUGUSTA MILITARY ACADEMY "The Friendly School." Distinguished ROTC school in Shenandoah Valley. Jr. & Sr. Divisions. Boys 10–20. Accredited. Graduates in leading colleges. All sports; pool, gym. Organized 1742. Rate $1,306. Catalog. **Principal, Box N, Fort Defiance, Virginia.**

BOLLES OF FLORIDA

Fully accredited. Sound base academic preparation. Grades 7–12. New conference-type classrooms. College Boards. Advanced Placement in English, Math. & Biology. Guidance. Varsity and intramural sports for all. Year-round golf, tennis, sailing. Outdoor swimming pool. *Write for illustrated Catalog.*

Registrar, Box 5037-N, Jacksonville 7, Fla.

BORDENTOWN MILITARY Fully accredited. College preparatory. General courses. Grades 8–12. Outstanding record of college entrance. ROTC. Boys taught how to study. Small classes. Sports for all. 82nd yr. Summer session. Catalog. **Registrar, Box 658, Bordentown, N.J.**

CARSON LONG Military School. Educates the whole boy—physically, mentally, spiritually. How to learn, how to labor, how to live. Prepares for college and life. Grades 6–12. 127th year of character building. Overall charges $1,500.00. **Box 21, New Bloomfield, Pa.**

CASTLE HEIGHTS

MILITARY High Standards

Accredited. 97% of 1962 class in leading colleges and gov't academies. Junior School in separate plant. Boys taught to study and inspired to excel. Guidance program. Remedial reading. R.O.T.C. 12 buildings, swimming pool, golf, aviation. A Bernard Macfadden Foundation school. Address:

Registrar, Box 883 N, Castle Heights, Lebanon, Tenn.

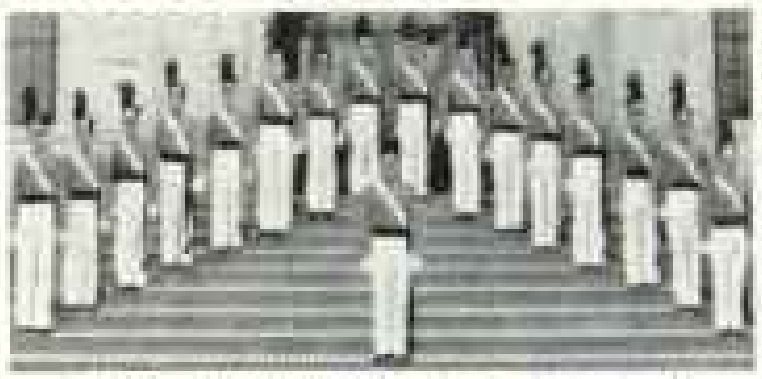
CULVER On Lake Maxinkuckee. Develops initiative, self-reliance, courtesy, poise. Grades 9–12. Thorough college preparation. Accredited. Exceptional facilities. Leadership training. Black Horse Troop. Artillery. Infantry. Band. ROTC. Sports. Scholarships available. Catalog. **89 Pershing Court, Culver, Indiana.**

FARRAGUT Fully accredited college preparatory. Toms River, N.J.; St. Petersburg, Fla. Naval training. Also Jr. School in Fla. Guidance for college and career. Sports: boats; tennis; bands. Camp and approved summer school. Please specify catalog desired. **Admiral Farragut Academy, Box L, Toms River, New Jersey.**

FLORIDA AIR ACADEMY Accredited Preparatory School for leading colleges and service schools. Located near Cape Canaveral. Grades 5–12, small classes, new gymnasium. All sports, golf & swimming. Military training (flight optional). Summer School and Camp. Write **Florida Air Academy, Melbourne 2, Florida.**

FLORIDA CENTRAL ACADEMY Nationally accredited. College Prep. "In the land of the Sun." Small Classes with tutoring. 30-acre campus. Outdoor pool, golf. All Athletics. Colorado Summer School. Moderate rate. Catalog. Address **Dean, Box 38, Sorrento 4, Florida.**

FORK UNION MILITARY ACADEMY



Our ONE SUBJECT PLAN of study in Upper School (grades 9–12) has increased honor roll 50%. Develops concentration. Fully accredited. ROTC highest rating. 12 modern bldgs., 2 completely equipped gyms, 2 indoor pools. Splendid environment, excellent health record. **Junior School (grades 1–8) has separate buildings, gym, pool, Housemothers.** 65th year. For ONE SUBJECT PLAN booklet and catalog write:

Dr. J. C. Wicker, Box 308, Fork Union, Va.

GREENBRIER MILITARY SCHOOL 152nd year. School of Achievement. Grades 7–12. Accredited. Study help. ROTC. White Sulphur Springs golf and swim pool. Athletics for all. New Library & Science bldgs. Catalog. **Admissions Director, GMS, Box M388, Lewisburg 3, W. Va.**

HARGRAVE MILITARY ACADEMY FULLY accredited. College preparatory, general courses. Grades 8–12. Boys study training, remedial and developmental reading. Separate Jr. School. All sports. Summer School. Est. 1909. Catalog. **Col. Jas. H. Cosby, Box N, Chatham, Va.**

HOWE MILITARY SCHOOL Academic training in spiritual environment. Accredited preparatory. Parental Achievement Plan helps give each boy a goal. Jr. School. Sr. ROTC. Sports. New dorms and pool. Episcopal. Catalog. **S. B. Bouton, 981 Academy Pl., Howe, Ind.**

MASSANUTTEN MIL. ACAD. Accelerated College Prep. New Dorm. Gym & classrooms. In healthful Shenandoah Valley. Small classes. ROTC. All sports. Riding. Indoor tiled Pool. Band. Rifle. Grades 8–12. 64th yr. Catalog. **Col. R. J. Benchoff, Sr., 12, Woodstock 3, Va.**

MIAMI MILITARY ACADEMY FULLY accredited. College prep. Grades 8–12. NDCC Honor School. 38th yr. Boys learn to study; inspirational instructors. 30 acres. Sailing; pool, gym. Athletics for all. Moderate all-inclusive fee. Summer School and Camps. Catalog: **10607 Biscayne Blvd., Miami 38, Florida.**

MISSOURI MILITARY ACADEMY Separate Junior School. 75th Year of Leadership! Fully accredited, grades 5–12. College Prep. Sr. ROTC. Small classes, finest teachers. New academic bldg., chapel, 320 acre campus, 5 athletic fields, golf, riding. Catalog. **Col. C. R. Stribling, 383 Main Street, Mexico, Mo.**

NEW YORK MILITARY ACADEMY Dimensions today's Youth for tomorrow's world by building mind, body, character, leadership. ROTC. Graduates all colleges. Sports, swimming. Band scholarships. Grades 8–12 and P.G. Catalog. **72 Acad. Ave., Cornwall-on-Hudson, N.Y.**

NORTHWESTERN MILITARY AND NAVAL ACADEMY Episcopal-related college preparatory, military school. Lake shore campus. Est. 1888. Accredited. Small classes. College Board center; expert guidance. ROTC. Sports. New gym. Catalog. **58 S. Lake Shore Road, Lake Geneva, Wis.**

OAK RIDGE MILITARY INSTITUTE 112th year. High school, Junior college. Enrollment 110. Balanced program. Small classes, supervised study. Reading development. Sports. Band. U. S. Army ROTC. Address: **Col. T. O. Wright, Supt., Box N, Oak Ridge, N.C.**

ONARGA MILITARY SCHOOL Trains for character. Individual study program; homelike living. Accredited. College preparatory, business. Small classes. Guidance. Grades 7 to 12. Music. Pred. Moderate fee. Chicago 85 mi. Catalog. **Col. L. W. Adams, Box W, Onarga, Illinois.**

PEACOCK MILITARY ACADEMY A Distinctive School since 1904. All round development. Fully accredited. Ages 12 to 18. Limited enrollment. Small classes. All sports, pool, gym. Write! **Supt., 684 Peacock Ave., Woodlawn Lake, San Antonio 1, Texas.**

PEDDIE Warm Christian influences prevail and the development of character is combined with high scholastic attainment. A college preparatory school for boys, grades 7–12. Fully accredited. All sports. Just off N. J. Turnpike (Exit 8). Write: **Dr. C. O. Morang, Headmaster, Box 5-N, Hightstown, New Jersey.**

PEEKSKILL MILITARY ACADEMY Grades 7–12. 100% last year's graduates accepted by colleges. Small classes. Advanced study opportunities in languages, mathematics, science, history. Sports for all. Gym, pool. Catalog: **Box N-8, Peekskill Military Academy, Peekskill, N. Y.**

RANDOLPH-MACON ACADEMY Military. Accredited. 72nd Year. At northern entrance to Skyline Drive. Prepares for college by intensive study methods. Fireproof bldgs. Superior equipment. Fine catalog and "Your Boy"! **Col. John C. Boggs, Pres., Box E, Front Royal, Va.**

RIVERSIDE MILITARY ACAD. Summer & Fall in Georgia Mts., Winter at Hollywood, Fla. Accredited college prep. ROTC. Outdoor sports. Weekly reports. Grades 8–12 & P.G. All inclusive School Bill $1701. Catalog. **Gen. Sandy Beaver, Pres., Box 388, Gainesville 3, Ga.**

ROOSEVELT MILITARY ACAD. "Builders of Men." More Fundamentals. Daily tutoring. Successful College Entrance. Accredited. Career Guidance. Grades 7–12. All sports; Band; Riding. Aviation. Moderate rate. Catalog. **Col. Glen N. Millikan, Box N, Aledo, Illinois**

St. John's MILITARY ACADEMY

Where boys become self-confident men. Accred. college preparation under famous St. John's System. Grades 8–12. Inspired teaching, small classes. Reading Clinic. ROTC. Fireproof dorms. Sports. Summer camp. 79th yr. Catalog.

Director of Admissions, Box 1332, Delafield, Wisconsin.

SHATTUCK SCHOOL Boys. Grades 9–12. Balanced educational, religious, military. Accredited college prep. General courses. Small classes. Sr. Basic ROTC. Sports. Gym, pool, golf. Episcopal. Est. 1858. Summer School. Catalog. **Dir. of Admissions, 635 Shumway Hall, Faribault, Minn.**

TENNESSEE MILITARY INSTITUTE Boys planning to attend engineering schools and leading colleges need thorough preparation. Over 90% of graduates enter colleges. Grades 8–12. Summer School. 95th yr. Catalog. **Col. C. R. Endsley, Jr., Box 147, Sweetwater, Tenn.**

This School Directory appears in the Magazine to serve as a guide to NATIONAL GEOGRAPHIC families in selecting the ideal school, college, camp, or home study course to meet their special needs. The organizations listed in the Directory will be pleased to send catalogs and viewbooks on request. By mentioning the Geographic you will receive the best possible attention.


Wherever you go . . . keep in touch by Long Distance
BELL TELEPHONE SYSTEM
Long Distance is the
next best thing to being there

INDEPENDENCE HALL

where you can touch the Bell that let freedom ring

No glass case for this historic treasure! The Liberty Bell can be touched by every visitor

Independence National Historical Park covers only five Philadelphia city blocks. Its greatest attraction, the Liberty Bell, is 36 inches high. But this small Bell is the symbol of man's greatest achievement — freedom.

Each year, more than a million people touch it with awe, as have kings, queens, world rulers, presidents. Put your finger to it, and

The Syng Inkwell, used at signing of Declaration of Independence

feel the pulse of history. Listen to its story; read the prophetic words inscribed on it in 1752: "Proclaim Liberty Throughout All The Land, Unto All the Inhabitants Thereof."

We almost lost our Bell. When it cracked, it was put away, almost forgotten. Independence Hall itself, our most hallowed shrine, was neglected, offered for sale. *But wise men remembered our heritage and worked to preserve it for future generations.* They have taught us conservation's lesson: that each new generation must be trustee of our historic and scenic treasures, and preserve others, too, before they are lost. For a nation needs pride in its past to face its future without fear.

There's much of our past in the nearby countryside: Valley Forge, Brandywine Creek and Gettysburg Battlefields. There's a living past, too, in the Pennsylvania Dutch country, where the "Plain People" keep customs unchanged in centuries, including a firm belief in the power of individuals to work out their own destinies.

Our Liberty Bell has power, too. And belief in that power seems to grow with each hand that touches it, each mind it fires with freedom, each heart it stirs with pride.

History lives again at Valley Forge

FREE—*Exclusive—Recreational Guide and Vacation Planning Map of National Parks—"What to See, What to Do, How to Enjoy Your National Parks." Includes points of unusual scenic and historic interest, accommodations, facilities and recreational activities. Write Sinclair for your free copy.*

FREE TOUR SERVICE—*Let Sinclair help plan your trip to Independence Hall or other National Parks, or anywhere in the U. S., Canada, Mexico. Write: Tour Bureau, Sinclair Oil Building, 600 Fifth Avenue, New York 20, New York.*

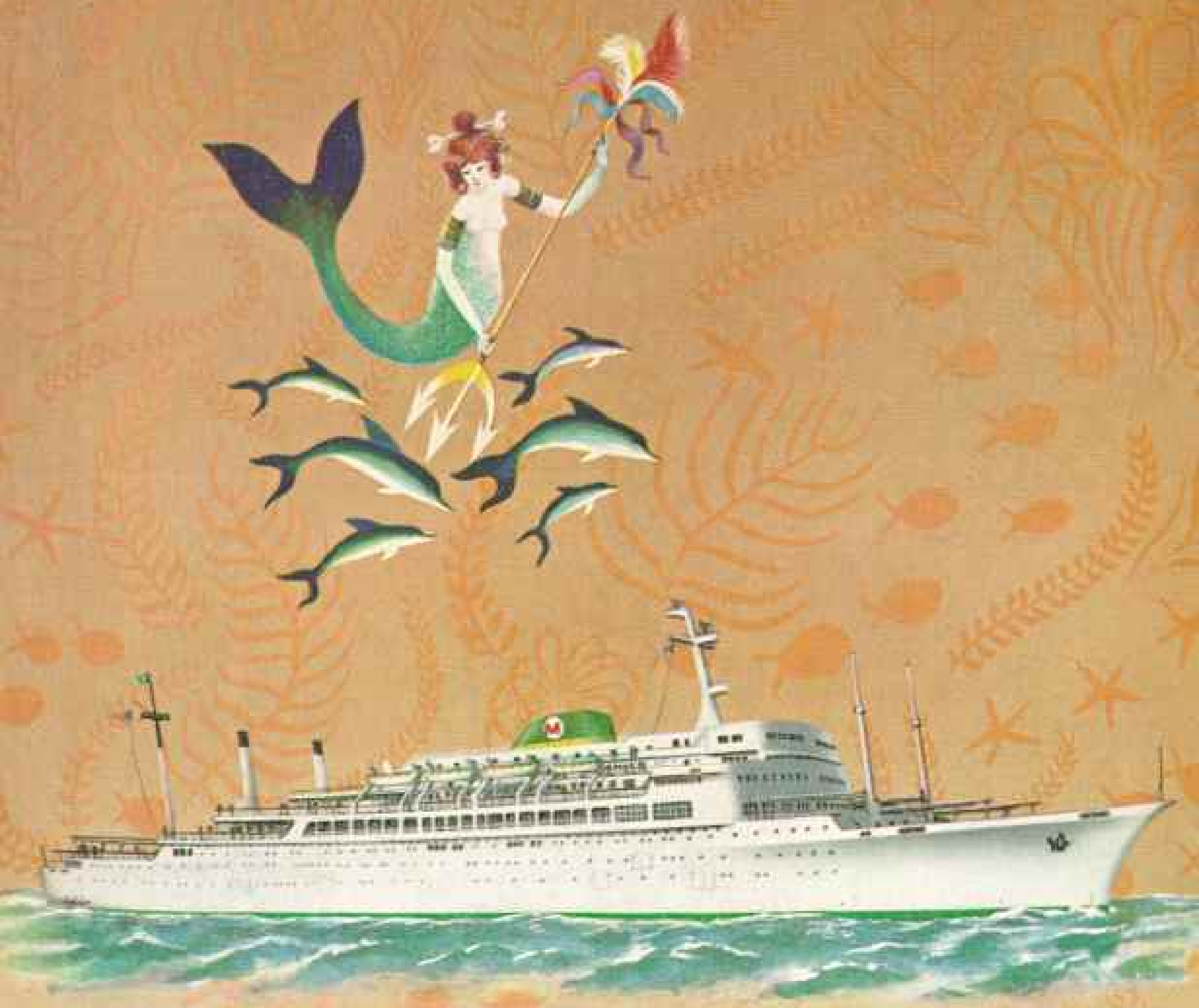
Decorative "hex" signs in Pennsylvania Dutch country

Sinclair

A GREAT NAME IN OIL

Another in Sinclair's Conservation Series to foster appreciation of our national heritage

The Luxury World of Moore-McCormack



This Cruise Will Stir Your Imagination

63-day Sea-Safari to South America-Africa-Mediterranean

Sail aboard ss Brasil for the unique pleasures of the 1964 Sea-Safari Cruise. Come take a delightful and fascinating look at South America . . . the Carnaval in Rio. Let the absorbing and magnificent grandeur of Africa stir your imagination. The sophisticated pleasures of Europe's fashionable Mediterranean resorts—from Messina to Lisbon. Enjoy it all in uncrowded leisure. Come home relaxed and refreshed after two glorious months aboard America's newest luxury cruise liner. Ask your travel agent or write us direct for colorful, illustrated brochure.

Sail from New York on January 29, 1964 (from Port Everglades, Fla., January 31) for . . . Barbados • Bahia • Rio de Janeiro • Santos (São Paulo) • Montevideo • Buenos Aires • Tristan da Cunha • Cape Town • Durban • Lourenço Marques • Zanzibar • Mombasa • Aden • Suez • Alexandria • Messina • Naples • Cannes • Barcelona • Lisbon.

39-day Carnaval-in-Rio Cruise—ss Argentina—from New York Jan. 17 (Port Everglades, Fla., Jan. 19)

MOORE-McCORMACK LINES

Two Broadway • New York 4, N.Y.