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ARAMCO WORLD

NOVEMBER-DECEMBER 1967

CAMPING IN THE EMPTY QUARTER

ARAMCO WORLD
magazine

Cover: At ages seven and four, Kevin and Riki Mandaville – pictured with a new-found Bedouin friend in this color photograph by Sa'id al-Ghamidi – are already learning to love the desert as much as their father, who came to Saudi Arabia at age 13 with his father. The story of the boys' camping trip to the Empty Quarter with their parents and another American family begins on page 26.

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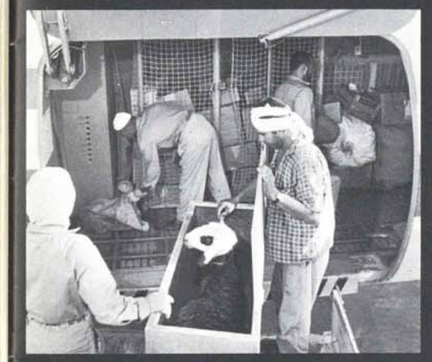
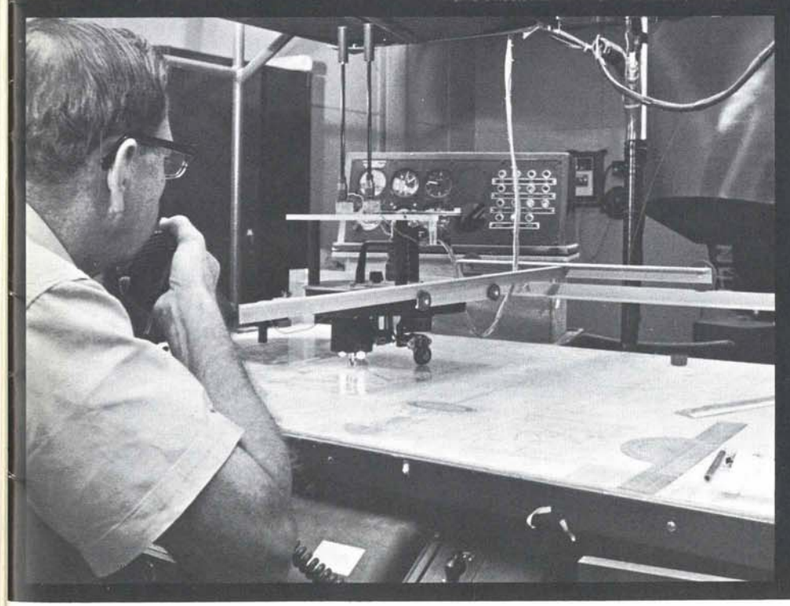
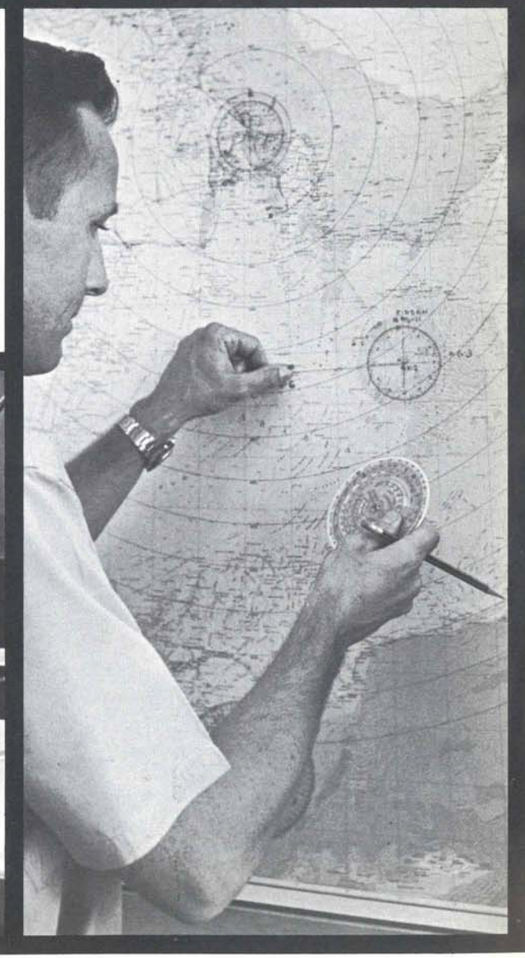
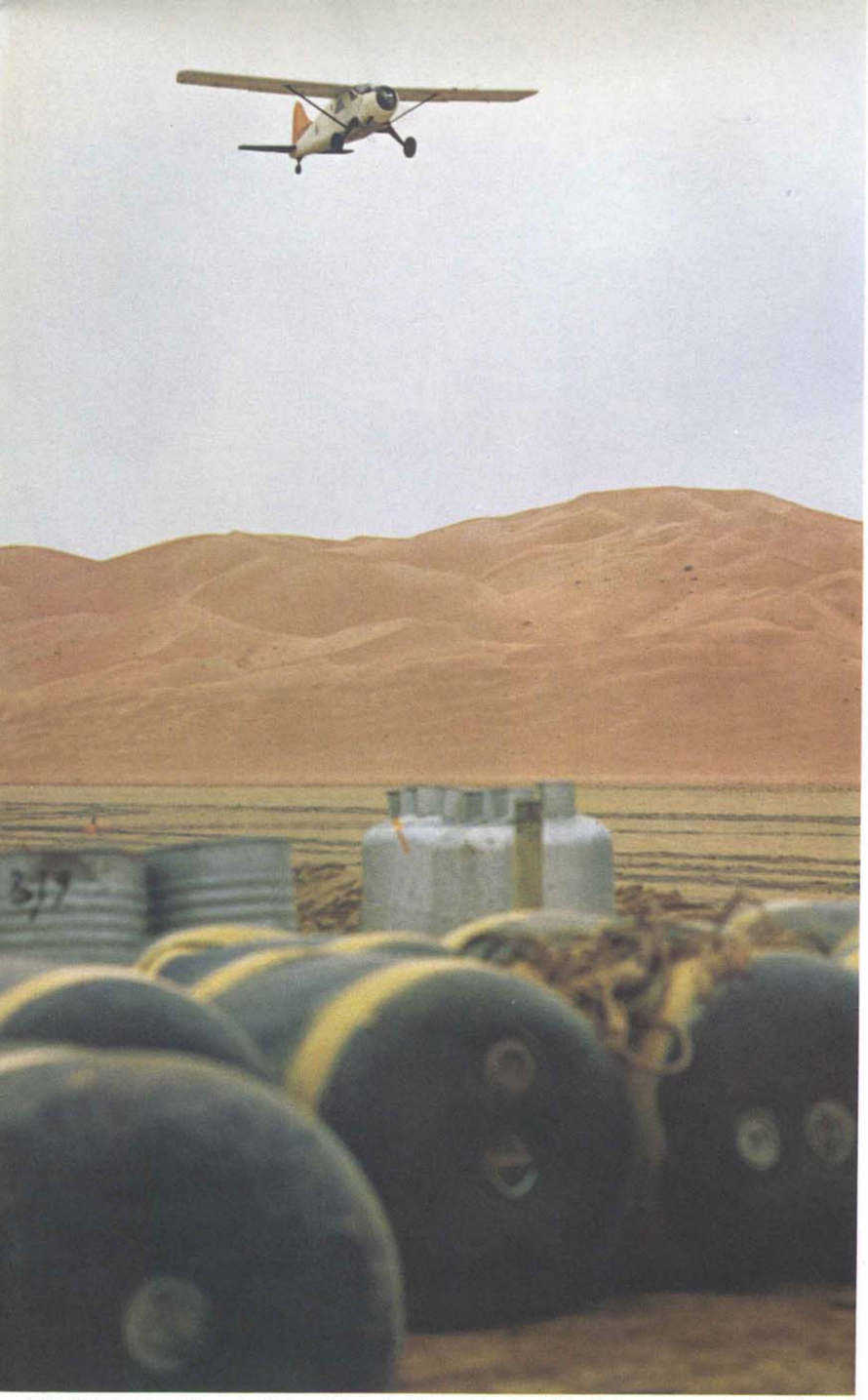


To move supplies and men, and speed the search for oil...







In the Sand Mountains, a Beaver aircraft returns to base after delivering rubber drums of diesel fuel to a remote exploration "spike camp".

FLY THE DESERT SKY

BY WILLIAM TRACY

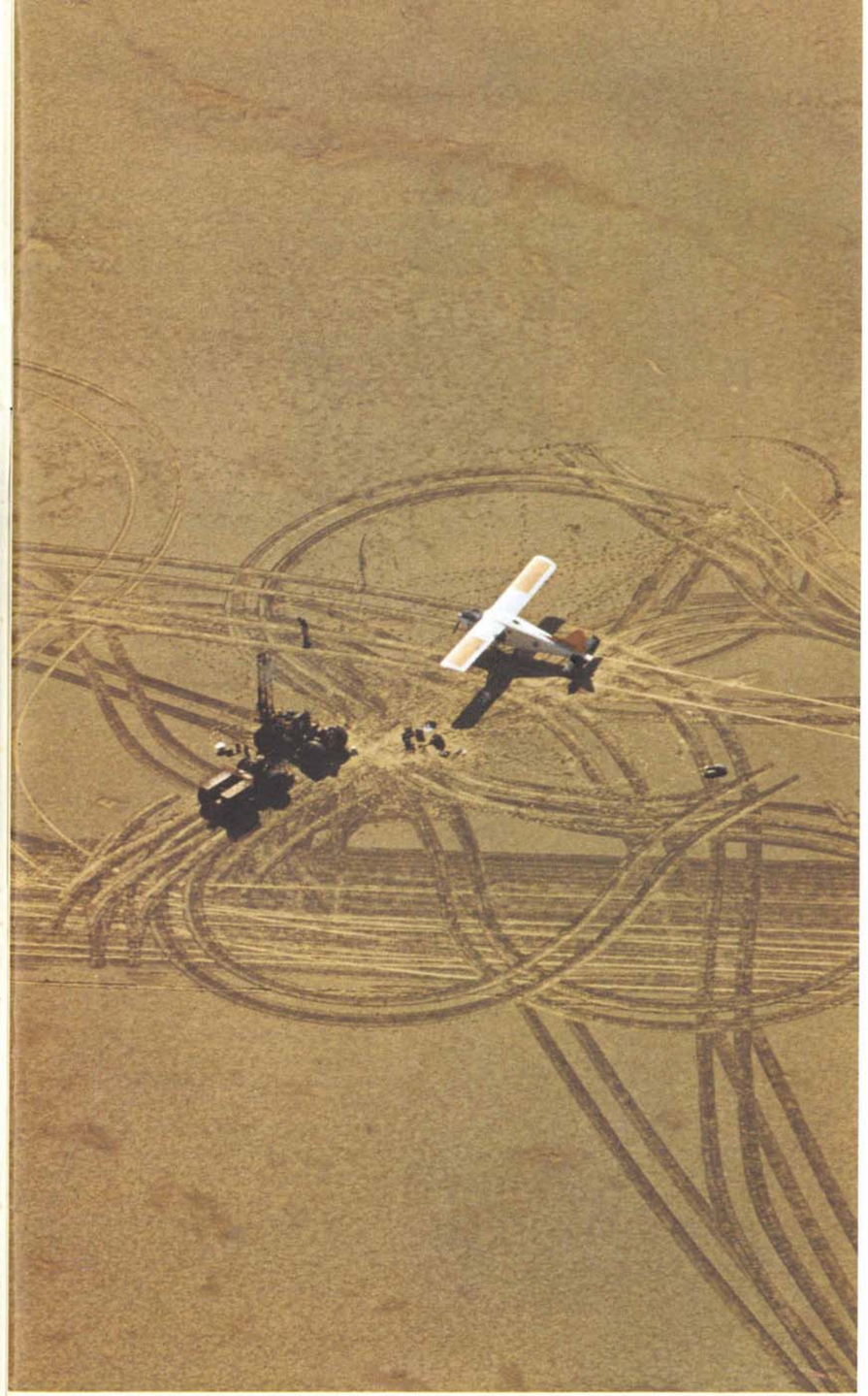
PHOTOGRAPHY BY BURNETT H. MOODY AND S. M. AMIN

In July 1956, a national U.S. magazine published a two-page map charting all air traffic over the North Atlantic at midnight on a random spring night. It showed that there were 110 aircraft: 39 military planes, 70 commercial flights representing 18 airlines and, just about halfway to Europe, a lone DC-6B owned by a somewhat unusual airline—the Arabian American Oil Company.

It probably seems odd today to think that an oil company operating exclusively in a country as far away as Saudi Arabia would ever have operated an international airline. But 20 years ago when that airline was organized, commercial air service into and out of the Middle East was not what it is today. It certainly wasn't sufficient to meet the pressing needs of a company engaged in the enormous post-war development of some of the world's biggest oil fields. So it was that on an April day in 1947 an Aramco pilot gunned a DC-4 Skymaster, the "Flying Camel," down a runway on Roosevelt Field, Long Island and headed for the Azores on the first leg of a 7,000-mile trip that after stops in Lisbon, Rome and Beirut, would end on the sandy shores of the Arabian Gulf.

Many Aramco veterans consider the late 40's and the 50's as the golden years of the company's Aviation Department—and with some reason. Before widespread commercial jet service finally eliminated the need for Aramco's own transatlantic flights—which ended on January 1, 1961—the "Camel" and her two younger sisters, the "Gazelle" and the "Oryx," had grown to DC-6B's and the company had logged a remarkable record. It had flown 17,200,000 miles with 87,600 international passengers and 7,300,000 pounds of cargo, made 2,400 Atlantic crossings and completed a satisfying 13½ years of scheduled international service without a single fatality or injury.

But though small when compared to those golden transatlantic years, Aramco Aviations' operations in Saudi Arabia today are equally impressive in terms of scope and variety. The department has ten planes: three single-engine Beavers which can carry 1,200-1,500 pounds of supplies or five passengers, five DC-3s (two on lease to the Trans-Arabian Pipe Line Company (Tapline)) and its most recent acquisitions, two Fokker F-27 "Friendships," manufactured in Holland. The company has also leased five Bell helicopters for special exploration work and a deHavilland twin Otter which can carry 4,000 pounds or 13 passengers—three times the load of a Beaver—yet is still able to land on a short field.



When it is impractical to tow disabled ground equipment to camp for repairs, a Beaver flies a mechanic and tools directly to the breakdown site.

The men who fly Aramco's planes are the last to suggest that they have adventurous jobs. "Routine," they insist. "It's just routine." But they often fly, nevertheless, over what has been called "the world's bleakest terrain," the 250,000-square-mile Rub' al-Khali or Empty Quarter. And even R. F. "Moe" Morris, who flew one of the company's first DC-3s from Texas in 1947 and is now manager of the Aviation Department, acknowledges that flying there can be difficult.

"Flying in most of Saudi Arabia is like flying anywhere," he once said, "but when you get down *there*, there's *nothing*. You'll fly for hours without seeing a living thing: man, beast or vegetation. No roads or railways, no lakes or streams, no woods, no villages. Just great stretches of sand or gravel between the rolling dunes or occasional limestone hills and escarpments."

According to the pilots, desert flying can at times be like no other challenge they have ever faced. Although there are short range radio beacons at all outlying exploration camps to guide planes in, the fliers still must turn often to dead reckoning navigation when they get out of range. On other occasions sandstorms whip up such dust that pilots can't see a camp a mile away. And in summer it is worse! In winter, cold air masses can hold the dust to a 4,000-foot ceiling but in the hot part of the year pilots have to climb as high as 14,000 feet to find a blue sky.

Summer poses other problems too. At high temperatures, the air density reduces engine efficiency and power so that pilots must cut their cargo loads, and on short trips, when there is no time to rise above the heat bumps, there is a mean bounce in the ride. The new helicopters just leased had to have their motors especially adapted for the scorching summer temperatures.

But extreme conditions like these don't mean that air transport in the desert is too difficult or too hazardous. On the contrary, they make it indispensible.

"If you had the time, money and patience," Bob Carr of the Exploration Department says, "I suppose 90 per cent of the concession area could be covered in conventional ground vehicles, that is two-wheel drive with sand tires." But

beyond the inhabited areas travel is tediously slow; a convoy of trucks to the eastern section of the Rub' al-Khali—where Aramco is now working—takes a month to make the long round trip, even though the vehicles are equipped with huge sand tires for the Sand Mountains territory and oversized radiators which are needed in very hot weather.

Even in areas where there are good blacktop roads distances are great—it's a 12-14-hour drive by bus from production workers' homes in Hofuf to the Arabian Gulf oil fields at Safaniya—and during sandstorms low-skimming sand just a few feet off the ground sometimes cuts horizontal visibility and closes roads while vertical visibility for planes remains excellent.

But given the desirability of air transport, there are still problems to face. How, for example, do the Aramco planes manage to set down safely in a hostile desert miles away from their Dhahran headquarters? One pilot explains that this is not as great a problem as might at first be expected. "There are probably more air strips here in a 500-mile radius than anywhere else in the world," he says. "All you need is a bare expanse of gravel floor with a stretch marked out with a streak of oil, four barrels, or four flares at night and presto, there's an airstrip."

It's not quite *that* easy, of course, but the pilots have found most of the desert accessible to their planes with a minimum of preparations and precautions. The trick is to choose a good site. Near the Arabian Gulf, for example, there are *sabkhahs* or salt flats so smooth, according to one flier, "that you'd think they'd make beautiful landing strips—if you didn't know better. The airplane could sink in them up to the fuselage."

Such strips, fortunately, can be packed down firmly just by driving heavy trucks across them. Furthermore, the DC-3s have low-pressure tires and can land on flat stretches of sand or gravel marked by car tracks. When heavy traffic is anticipated, a mixture of clay and sand is dumped, graded, watered and rolled until it can support the weight of a plane.

Aramco aircraft have played a valuable role in the company's exploration efforts almost from the beginning. The planes became doubly important when gravity and seismic crews began searching for oil in the Sand Mountains of the eastern Rub' al-Khali. Small, five-place Beavers provided support from base camps to outlying "spike camps" for gravity crews, who for ground transportation used light four-wheel drive vehicles. In seismic exploration, crews record shock waves set off by controlled underground explosions to learn about substructures. The earliest seismic exploration in the eastern Rub' al-Khali was principally for reconnaissance, the shot holes were located in a somewhat random pattern, and seismic crews, also traveling in large-tired four-wheel-drive vehicles, worked along exposed and relatively flat *sabkhahs* rather than over sandy areas because the former were easier to get to and offered better conditions for recording.

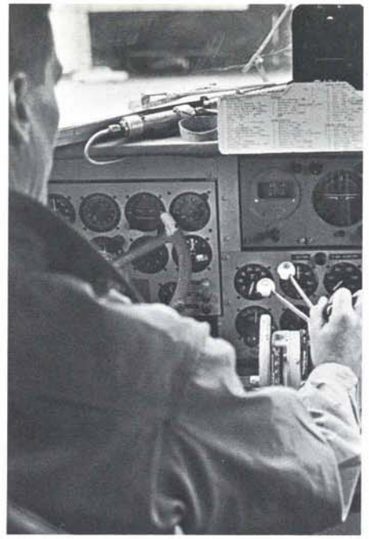
As the company required more and better information on substructures, Aramco's seismic exploration moved into a second phase during which crews were required to set their shot holes in straight lines at regular intervals, regardless of the terrain encountered. This meant working on both *sabkhahs* and in sand dunes, which in the eastern Rub' al-Khali can rise as high as 700 feet and have slip faces as steep as 30 degrees. The new conditions called for new types of land and air transportation suitable to these challenging surfaces. Sand buggies—called marsh buggies when employed in Louisiana oil exploration work—were required for carrying recording, drilling and shooting equipment over the varying areas of operations. Five helicopters, whose speed and flexibility make them well suited for exploration in the Sand Mountains, were leased to carry personnel and supplies from spike camps along the shot lines. A twin Otter was found to be well suited as the air link between the seismic party's base camp and its spike camps.

In good weather, each of the five helicopters, can carry 600-pound loads at about 70 miles per hour while Power Wagons or sand buggies can only carry reduced loads of 1,000-1,500 pounds because of the terrain, and creep about at 10 miles per hour. Furthermore, the 'copters can fly straight up the steep leeward face of a dune from the usual Beaver and Otter landing strip found in outlying camps, making unnecessary miles of driving around the "mountain" to the gradually-inclined windward slope.

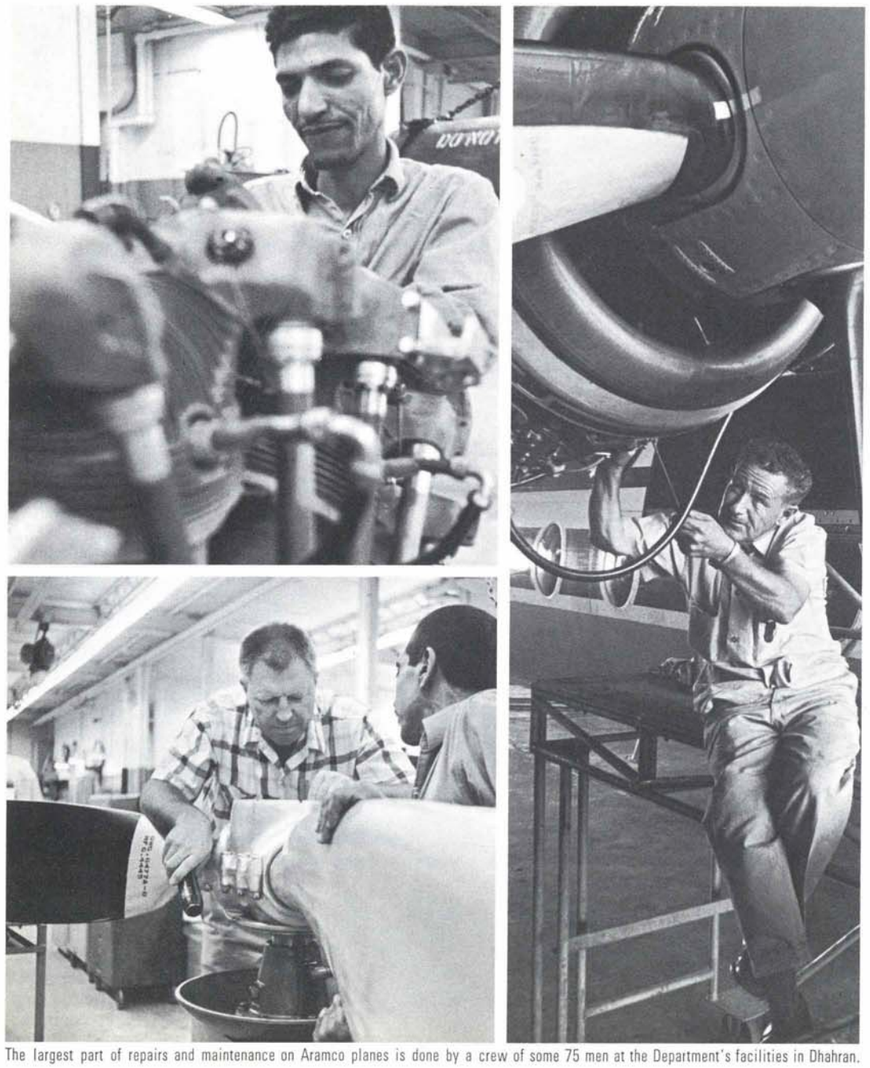
"Of course the work could be done without helicopters," one exploration man admits, "but it would be extremely difficult without the mobility and speed they offer us." Now helicopters are being considered for future offshore work in the Gulf.

The two new F-27s are the main exploration camps' aerial link with Dhahran. Named after the trimotor which pioneering Amelia Earhart flew across the Atlantic in 1928, the "Friendships" are powered by twin turbo-prop 1,930 HP Rolls Royce engines and can operate from a 5,000-foot runway. These pressurized "combi-planes" carry 40 passengers or 12,000 pounds of freight, are readily convertible to combinations of personnel and cargo. Unlike most big planes, the F-27s, which sit low to the ground but have high wings mounted on top of the fuselage, offer excellent passenger visibility. With a range of 1,200 miles, they can cruise at 279 mph, at 21,000 feet. The F-27 was explicitly designed by Fokker as an updated replacement for aging DC-3s, and since 1958 it has found customers in 33 countries. For Aramco, the two F-27s replaced not only two DC-3s, but two Convairs as well.

Since the Fokker is also manufactured under license in the United States by Fairchild, the two newest planes carry distant echoes of Aramco Aviation's humble beginnings. That was back in 1934 when two young pilots named Dick Kerr and Charley Rocheville escorted a Fairchild 71 single engine by sea from New York to Alexandria, Egypt, and then daringly "hopped" it to Saudi Arabia under its own power by way of Cairo, Gaza, Baghdad, Basrah and Jubail where the



An Aramco pilot checks the controls of a company DC-3.



The largest part of repairs and maintenance on Aramco planes is done by a crew of some 75 men at the Department's facilities in Dhahran.

Mechanical supervisors fly to the Sand Mountains regularly to give 100-hour checkups to the Beavers attached to exploration parties there.

first exploration parties were waiting desperately for an "aerial eye". Their flight was really the start of Aramco's airline.

The early days of flying in Arabia have given birth, of course, to numerous legends. One tells of the time when a hive of bees broke loose from their crate on a flight to the al-Kharj experimental farm. Then there's the story of the 60 screeching prize hunting falcons which were flown tied to a burlap-covered plank for a local amir. There was also the old Bedouin who tried to cook his dinner on an open fire in the cabin.

Later the DC-3s which used to fly to Asmara, in Ethiopia, to pick up fresh fruit had to be "trimmed" or leveled with ballast on the empty leg of the flight. One pilot remembers seeing piles of Arabian sand which had been dumped over the years at the edge of the loading ramp at the Asmara airport and being questioned by a friend there, "Do you really think you'll ever be able to get *all* the sand out of that country?"

Once, short of fuel and lost in a dust storm, another pilot landed on a mesa in the middle of the desert, miraculously coming to a halt just two feet from the edge. When the weather cleared he had no idea where he was and radioed for help. Aramco quickly put their chief guide, Khamis ibn Ranthou on the air. Khamis, through some Yemeni passengers on the plane, got local Bedouins to give some of the names of local geography and was able to guide a rescue party to within a half mile of the downed plane.

The pilots soon learn to recognize what few landmarks there are and give them pet names. Those who flew the "milk run" to Beirut, stopping at the pumping stations along the Tapline, used to call the pipeline "the Iron Compass". Coming into Abqaiq there is a series of long rocky outcrops with dunes stretching downwind like the wakes of ships. They look for all the world from the air like their nickname, "The Sixth Fleet".

For a short time, the early planes had names too. Tiny Navion aircraft went by bee or wasp, Beechcraft by woodpecker or parrot. DC-3s were called after larger birds such as sea gull or quail; the Convairs rated eagle or falcon. Now the planes go by simple number designations, all in the 700 block of numbers reserved for them by the US Federal Aviation Agency (FAA), whose strict regulations the company complies with.

Aramco pilots have carried drums of drinking water, diesel fuel, and gasoline for cars and the small desert-based Beaver aircraft. They have flown people who were ill or hurt, machine parts needed in a hurry, fresh vegetables to distant drilling sites, and even live sheep and goats for holiday feasts. On occasions they have engaged in emergency aerial searches for cars lost or stranded in the desert, or small boats adrift in the Gulf.

But today for the most part, the passengers and cargo are prosaic, the flights in the main, routine. They carry high school students to Beirut and Rome, executives to an oil congress in Baghdad, Government Relations spokesmen to Riyadh or Jiddah, inspectors along pipelines, exploration men to distant concession areas.

About 50 per cent of the flights are scheduled—such as the seven "commuter" flights per week that carry Saudi Arab workers from their homes in Abqaiq or Hofuf to the Northern Area fields. On these flights, pilots make a three-hour round trip from Dhahran, land half a dozen times, yet spend less than 30 minutes on the ground, sometimes never cutting their engines. One pilot, a New Yorker, fondly refers to this busy service as "The Brighton Beach Express," a nickname made all the more appropriate by the hissing of the F-27's air brakes as it taxis towards a ramp.

In 1966 Aramco's planes logged 1,028,928 miles in support of the company's operations. During a typical winter month such as last January, there were 138 flights—completely apart from Exploration's hundreds of base-to-spike camp shuttle flights—while for the entire year of 1967 the Aviation Department estimates its planes will have been in the air a total of about 6,800 hours.

Virtually all repairs and maintenance on the planes is done in Aramco's two 140×160-foot hangers which are located in a self-contained compound across the field from the terminal at Dhahran International Airport—though mechanical supervisors frequently fly down to inspect the Beavers stationed in the Rub' al-Khali itself. The maintenance section has roughly 75 men, three fourths of whom are Saudi Arabs.

Each plane has a daily inspection by the line crew, and a 100-hour inspection in which as many as a dozen men may be crawling industriously over the plane. To achieve maximum safety and efficiency, according to Hank Alisch, the superintendent, responsibility for a piece of work is fixed on one man. "He records the trouble, does the work and 'signs it off'". The shops work on everything from propellers and brakes to radios and seat cushions. Only for major overhaul are engines air-shipped to the United States —safely packed in airtight drums which resemble huge tin cans.

Sand and heat have been an annoying part of the maintenance picture for so long that they are considered routine by the men and no longer a special problem. But constant watchfulness is needed—and practiced—by the crews. Because many of the flights are a series of short hops (averaging 28 minutes) maintenance men discovered recently that a small motor which controls a wing flap and requires changing every 2,400 hours in normal use according to the manufacturer, in these operations needs replacement after only 1,100 hours.

The entire Aviation Department now consists of 108 men, 16 of whom are pilots. Each morning at 7:30 a group of these desert fliers—some now with more than 20 years of desert experience—report to the dispatcher's office to pick up their flight plans. The chief dispatcher, John Smith, will follow each flight path by VHF radio (Very High Frequency) until the plane returns to Dhahran and the flight log is closed out. In the office is a plastic notice board which on a typical day might have remarks like these neatly printed on it in orange crayon:

Safaniya—work starts next week on bump 800 feet from north end of runway.

Massawa—Goats seen on and adjacent to runway 9/7.

G-4—Elevation is 450 ft. instead of 485 ft.

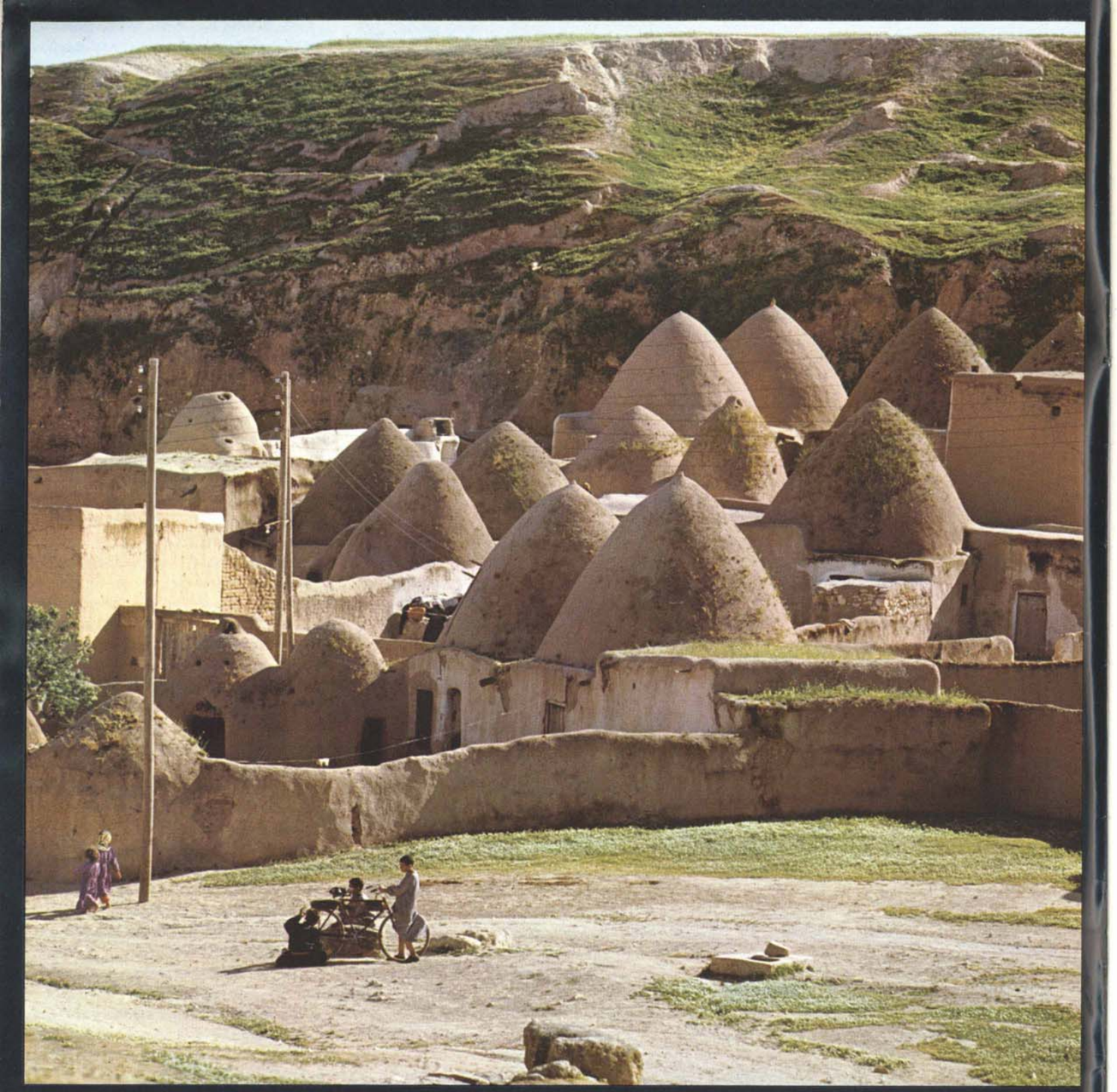
Jiddah—Crew members required to show health cards for smallpox and cholera.

G-3—Fresh oil dumped near runway on ramp. Do not taxi across it.

The Arabian Desert could, with some imagination, be considered a hot, dry counterpart of the wild and lonely North Atlantic Ocean. Choose any hour of the day and chart the desert sky. Chances are high that an Aramco plane will be up there, helping move men and supplies in the search for oil, on a dramatic errand of mercy—or just another routine run of the Brighton Beach Express.

William Tracy is Assistant Editor of Aramco World Magazine.

At the end of another flight, Aramco Aviation's newest aquisition, a turbo-prop Fokker Friendship (F-27), comes in low over al-Khobar on the shore of the Arabian Gulf as it approaches Dhahran International Airport to land.



primitive? or modern?
THE BEEHIVE ENIGMA

In this day of leopard-skin bikinis, hip talk and high-priced abstract art, distinctions between the primitive and modern in dress, language and art have become notably fuzzy. In the realm of architecture, they have occasionally become meaningless—as the enigma of the beehive houses of northern Syria demonstrates.

The conical dwelling, putative ancestor of the beehive house, predates man's recorded beginnings by a wide margin. Certainly among the first such dwellings were those of the Ürgüp Valley of Turkey's central Anatolian Plateau, dating to at least New Stone Age times. They owe their origin to Mount Argaeus, which in the distant past blew its top, distributing a layer of lava in a 40-mile radius around its base. During the ensuing millenia, wind and water eroded the valley, but as always in nature, unevenly: hard basaltic rocks littering the valley floor protected the softer volcanic stone directly beneath, leaving conical pillars standing like sentinels as the surrounding plain weathered away. Early Anatolian man hollowed out the cones by patient chiseling with flint and copper tools, and they became snug and secure habitations for the Hittite, Phrygian, Lydian, Greek, Armenian and Turkish generations that followed. Some are still in use today.

It is unknown whether independent invention or cultural diffusion from Anatolia was mother to the beehive house in neighboring Cyprus, but excavations reveal that they were being constructed there as long ago as 3,700 B. C. Remarkably like the Anatolian cones in size, form and function, Cyprus's so-called *tholoi* were, however, constructed of mud-brick or *pisé*, on a low masonry substructure. They contained hearths, platforms for sleeping, pits in the beaten-earth floor for the storage of grain, and even provided that ultimate in modern living—the split level. Less advanced, at least by current standards of togetherness, was the Cypriot custom of burying their dead in the floor of the main chamber, but for which it might have been called the living room.

At approximately the same period, *tholoi* were also being built and used as temples in Jericho on the shores of the Dead Sea, at Tepe Gawra northeast of Mosul in present-day Iraq, on the Lebanese coast at the ancient trading city of Byblos, and on the plains of northern Syria. At Khirbet Kerak (in northern Palestine) the beehive form reached its highest development, being used for structures of truly monumental proportions. One temple area was surrounded by a lava-rock wall four meters thick, and the temple walls proper, constructed of basalt rocks, were up to ten meters thick. Sunk into the interior walls were stone circles measuring up to nine meters in diameter, above which reared conical domes which, according to the canons of architectural design, must have been considerably higher, though they have long since collapsed. A comfortably old-fashioned feature of the Khirbet Kerak temple was built-in furniture—the use of which had been standard in Anatolian house construction since the seventh millenium B. C.

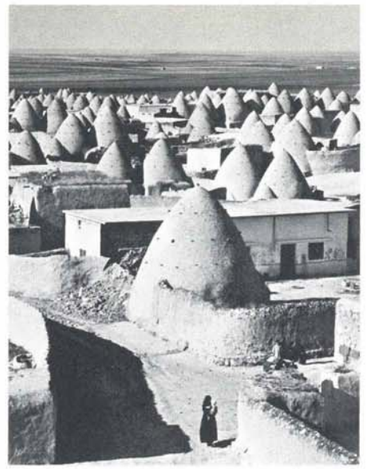
This wide distribution of a single building style in the same Chalcolithic era suggests a passing fashion. And it was—save in Syria.

In Syria this type of structure has persisted down to the present day, concentrated in whole beehive villages in the region of Aleppo. Eminent traveler Julian Huxley describes them as built of "unburnt mud or clay, with the floor slightly raised above the soil outside." The typical house is "spotlessly clean, with a recess for cooking and attractive decorations in bright tinsel paper on the walls. Though only a few yards in diameter, its high conical roof gave it a sense of space." In short, a structure different in no important respect from those built in the same area for the past 10,000 years.

Are we to ascribe the beehive house's tenacious longevity to mere inertia, to a sterility of the Syrians' inventive powers, or to the known conservatism of rural communities? Any of these explanations might be plausible, were it not that they also apply to the other beehive-house cultures where, however, this type of man-made housing vanished completely centuries ago. A more convincing explanation for this seeming enigma may be sought in the architectural response of "primitive" man to his environment.

In the Aleppo region this environment is especially harsh and uncompromising. Summers approach desert extremes in heat, and the only shade is the shadow cast by one's own body; winters are dry and cold, usually accompanied by bone-numbing winds off the bare plains. And his building materials? No structural steel, concrete, glass brick, plastic panel, ceramic tile, aluminum sheathing, or quarried stone—and even wood to construct a roof is rare and beyond the reach of the common man.

Restricted choice of building methods and materials left the north Syrians few alternatives, mostly painful. Their houses had to resist the mechanical stresses of wind pressure and the minor shocks of the frequent earthquakes which afflict the region. Door and window openings had to be few and small to minimize the sun's glare and the entry of hot air during the day as well as cold air at night. And they had to have a high-heat-capacity roof to absorb the sun's rays during the day, and slowly reradiate it toward the interior during the cool night; the roof, furthermore, should have a continuous surface to provide a maximum of shade with a minimum of area exposed to the sun, and it should slope steeply to shed the occasional but torrential rains. All this—and it had to built of the only abundant material locally available: adobe brick.



PHOTOGRAPHY BY THOMAS F. WALTERS

The beehive house was the answer, and one that a computer could scarcely improve upon. Its conical shape presents almost no structural difficulties, requires no high-tensile-strength reinforcements, and can be built quickly by unskilled labor. Inside, its high dome serves to collect the hotter air, and outside to shed rainfall instantly, before the brick can absorb it and crumble. Its thick roof-*cum*-wall is an excellent low-velocity heat-exchanger, and keeps interior temperatures between 85° and 75° F. while outside noon-to-midnight extremes range from 140° to 60°. Nothing cheaper—nor more rugged, more efficient, and easily serviced—can be built at the same site from local materials. The beehive house, moreover, attains that ideal that architects eternally seek but so seldom find: it combines functionalism with simplicity, elegance and beauty.

The Syrian beehive houses provoke more questions than they answer: Were they independent inventions or only copies? Do they predate their stone Anatolian analogues? How did their unlettered builders apparently achieve instant fulfillment of Frank Lloyd Wright's dictum that "form follows function"? Above all, how did the villagers of northern Syria —in a changing world that glorifies novelty for its own sake—have the wisdom of knowing when to stop? ———

BY JOHN BRINTON / Engravings from the author's collection.

THE MILLION DOLLAR BET

It was a grand night for Dublin, they said later, a grand night. There were fires burning in the hills, the people were cheering in the streets and the tavern keepers were handing out the whiskey as if it were water from a well. But then that was the night Buck Whaley came back from the Holy Land to win a wager worth one million dollars.

Buck Whaley, born Thomas Whaley of Dublin, was a most unusual young man even for an age when unusual young men were really not unusual. It was not merely that he was rich, although with an annual income of $500,000 he could certainly be called rich. Nor was it because he was reckless, although a man who cooly gambles away $100,000 in an evening is indeed reckless. Nor was it because of his impressive wenching and wining either; in 18th century Dublin all the wealthy dandies, or "bucks" as they were known, were more than ordinarily accomplished in such arts. Nor was it even because he did anything useful; he would have scorned that. No, what set Buck Whaley apart, apparently, was simply a capacity for living—a zest for risk, adventure and romance so strong that it led one admirer to extoll him as "the most flamingly spectacular Irishman in a flamingly spectacular 18th century."

BUCK WHALEY AS A BOY.

One night in Dublin Buck Whaley attended a party at the palatial residence of the Duke of Leister and regaled the guests with lurid tales of bizarre adventures in Europe during a recent trip. Then, asked where he was going next, he said, "Jerusalem," and with an impish smile, sat back to wait for the shocked reaction. It was not long in coming. As he well knew, the Irish of that period were not entirely certain that such a place as Jerusalem still existed, but in any case were bound to think that the fierce Turks who then controlled that part of the world would hardly be inclined to let Buck Whaley come to call.

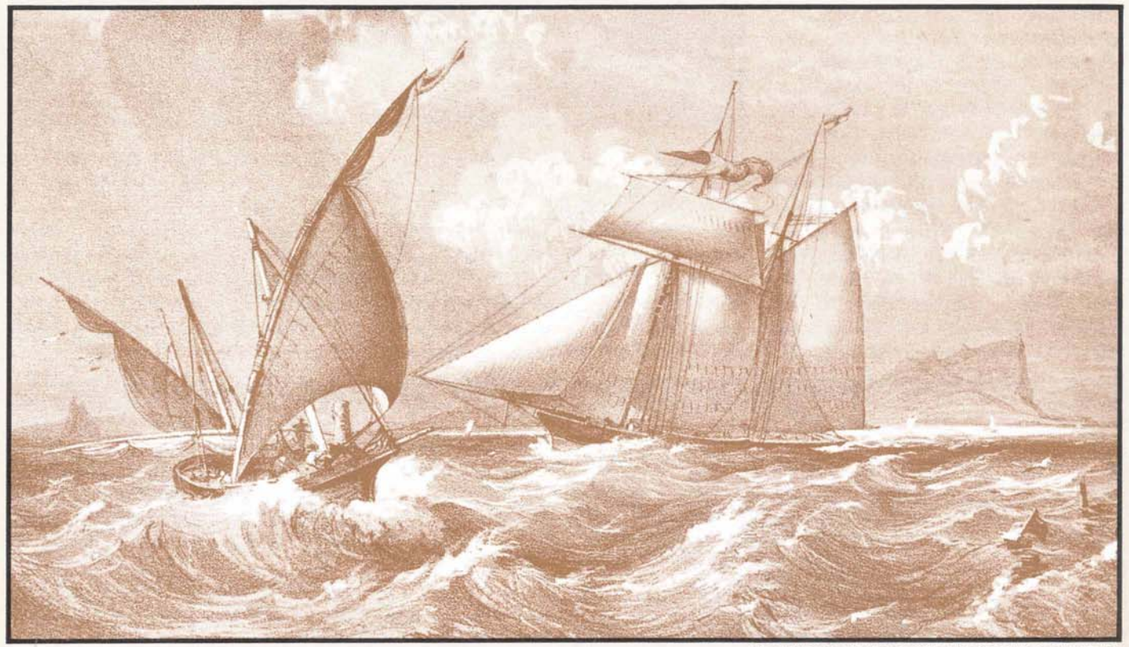
Sure enough someone challenged him. There is no such place as Jerusalem, he was told. There is, he insisted, adding that if the stakes were high enough he would be willing to go there to prove it. Within minutes, unbelievable as it may seem today, Buck was shaking hands on one of the most fantastic wagers of all time: the equivalent in today's terms of one million dollars that not only did Jerusalem exist, but that he, Buck Whaley, could go there and return, within two years, with "incontestable proof."

Precisely why anyone would have been foolish enough to either offer, or take Buck up on, such a bet seems incomprehensible, since a Frenchman named C. F. Volney had published a very accurate book just a year before about his travels to the Holy Land. It might have been that the English translation of the book had not yet reached Dublin. Or possibly it was because the Irish of the day still tended to cling to legends and myths in preference to fact. It could even have been that sly, well-traveled Buck Whaley, with M. Volney's book tucked away in his cloak, lured them into a trap. Since the source of most information about Mr. Whaley is Mr. Whaley's own memoirs, however, this point must remain a matter of conjecture.

Whatever the reason, the bet was made and on October 8, 1788, Buck Whaley set out for Jerusalem on a chartered yacht to the tune of "Whaley's Embarkation," a rousing melody the ballad singers of Dublin had improvised for the occasion. He brought with him a retinue of servants and a "large stock of Madeira wine" which, he said, he considered imperative for a long sea voyage.

The first stop along the way was Gibraltar. Although it was an unannounced visit, Whaley's reputation was so proverbial that the bored garrison, hoping for a break in the monotony, turned out to give him an enthusiastic welcome. Buck Whaley did not disappoint them. Lured by his reputation, Spanish beauties were soon thronging into the tiny colony. Party followed party, each more unrestrained than the previous one. He explored the stupendous hand-hewn galleries from which British guns looked down at the Mediterranean. At some parties ladies and their officers danced till dawn and at one ball, a Grand Ball for

"I'll go there myself," Buck Whaley smiled, "...if the stakes are high enough."



THE CRUSADER YACHT PASSING THE STRAITS OF GIBRALTAR.

which the governor, Sir Thomas Eliot, opened up his new house, Buck and a lovely dark-eyed belle danced the fandango for three hours. Afterwards they climbed to the top of the Rock, chased the famous Barbary apes and, as the sun came up across the blue sea, breakfasted on wine and Spanish delicacies. One young officer named Moore so enjoyed himself that he asked to join the expedition. When Whaley agreed he immediately started a diary which has also survived to corroborate much of Whaley's story.

From Gibraltar, Whaley, Moore, the servants, and the now considerably depleted stock of Madeira, sailed for Smyrna in Turkey. It was a stormy passage but when they sailed into the harbor, to the echoes of a 50-gun salute, and set eyes upon the splendors of the city they decided it had been worthwhile.

In the 18th century, Smyrna, now Izmir, was an exciting city. The emporium of trade between East and West, it combined the industriousness of the West with the excitement and pleasures of the East. On the docks lay piles of merchandise from the East: Turkish carpets, raw silk, camel wool and mohair, dried figs and raisins. Beside them lay the imports from the West: wool, cotton, lead, tin and glass. Along the streets proper Europeans marched side by side with all varieties of people from the Levantine coast, many dressed in the picturesque styles of their age and their land. There were Turkish baths and oriental cafes. There was a European theater and a casino. And there were women, many the wives or daughters of inter-married Europeans and Levantines. They were, Buck noted, unusually handsome. They wore their hair, he said, in long luxurious plaits and dressed in baggy trousers reaching to the ankle and rich embroidered vests lined with velvet and trimmed with fur.

Not surprisingly, Buck and his companion were enchanted. And since wealth, good looks and dash were then the "Open Sesame" to the country's highest circles,

Whaley and Moore were soon overwhelmed with invitations. They went to balls where they taught the ladies the latest dance steps of London. They went hunting in lavish splendor in nearby forests. In the evening they plunged into mountainous meals and tried the pleasures of the "tendour." The tendour, Whaley explains, was an unusually pleasant way of keeping warm in drafty and unheated homes during Smyrna's damp, dismal winters. It was no more than a square table with a brazier of hot coals under the center and quilted coverings draped across it and extending onto the floor. When guests sat around the table and pulled the covers over their heads it provided a sort of indoor tent that was warm, cozy and private. It was, Mr. Whaley added innocently, the most frequented spot in every household.

But for all its pleasures, Smyrna was not Jerusalem, and so after a final round of balls and picnics, Buck set out on the next stage of the journey, the overland road to Constantinople. It was a dangerous trip and to help disguise themselves they wore Turkish traveling costumes and strapped on knives and pistols—foreshadowing by 40 years Lord Byron's account in verse of the joys and romance of oriental travel.

HASSAN PASHA.

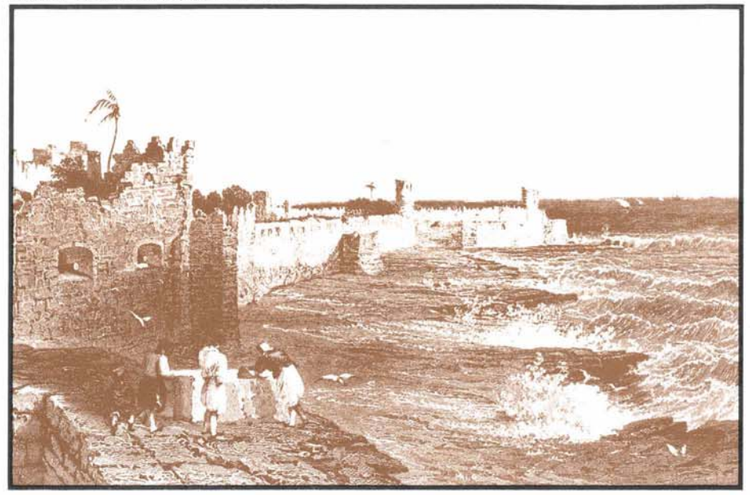
On Whaley's 22nd birthday, Buck and Mr. Moore, having survived the hazards of the journey, clattered into the outskirts of dazzling Constantinople and from the hills nearby caught their first glimpse of the famous Bosporus inlet that was called the Golden Horn. It was a vision of palaces and minarets jostling for place on the shores of the Strait, all dominated by the magnificent Seraglio, the palace from which the Sultan of Turkey ruled the vast Ottoman Empire.

The Seraglio, now a museum called Topkapi (recently the setting for an exciting jewel theft film) was then a most mysterious place. It sprawled endlessly across a point of land overlooking the Golden Horn and within its labyrinthian series of courtyards and residences lived and schemed the men who controlled—or tried to control—the widespread Ottoman Empire. Within too, lived the aging debauched head of this empire, Sultan Abdul Hamid I.

As it happened, the Ottoman Empire had in 1773, suffered a major defeat at the hands of Catherine the Great of Russia, as a result of which Turkey had been forced to make a humiliating treaty with Russia. Another result was that Pasha Hassan, Admiral of the Turkish Seas and the real power behind crumbling Abdul Hamid, had begun to strengthen Ottoman ties with England in order to counteract Russian power. Nothing therefore, could have delighted him more than an opportunity to show his friendship to the

CONSTANTINOPLE.

WALLS OF ST. JEAN D'ACRE, NEXT THE SEA.



West—an opportunity that Buck Whaley soon gave him.

As at Gibraltar and Smyrna, Buck got off to a flying start. Striding into the French Tavern, the best hostelry in Constantinople, he and the ever-present Mr. Moore quickly swapped their exotic traveling costumes for their most extravagant European finery and began to make preparations for presentation at the Sublime Porte, as the Ottoman ministries were called. In light of the new friendship between the Porte and Great Britain this was easier to arrange that one would have thought and soon Sir Robert Ainslie, the British ambassador, was bowing Buck and his friend into the presence of Pasha Hassan.

Once again the Whaley charm made its mark; the aging minister—he was then 76—and the young adventurer, just 22, became fast friends. Permits to visit Jerusalem? Of course. Introductions to powerful friends? Certainly. And much more. The mysteries of the Orient, for example, those much whispered delights that few, if any, foreigners had ever seen. "Oh pleasures past, never again to return," wrote Buck the next morning in describing an incredible evening behind the curtains of mystery.

Once exposed to the charms of the East he was insatiable. For the next few weeks he spent his waking hours in dining and hunting. He also wandered through the bazaars buying silks and furs and weapons.

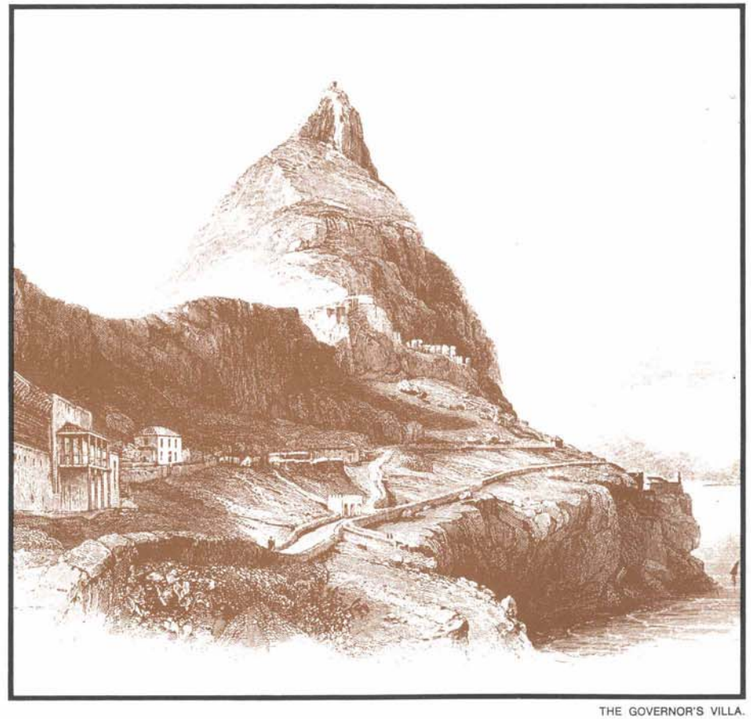
But although his great wager was occasionally made to wait, it was never quite forgotten, and so on January 21, 1789, Buck sailed for the Levant, his pockets stuffed with permits and letters to the governor of the Holy Land. Not long after, he dropped anchor off the coast of St. Jean d'Acre, stronghold of the governor, a local ruler called, somewhat ominously, al-Jazzar, "the Butcher."

Al-Jazzar was then the ruler of all the Levant. A Bosnian, he had won his position by intrigue and murder and was very proud of his title. In 1789 he was at the height of his power.

When the two young gallants went ashore they found al-Jazzar seated under a magnolia tree, the British vice consul kneeling before him in a "humiliating position" and trembling in every limb. But again the Whaley charm prevailed; al-Jazzar invited him to sit at his right and began to tell him the story of his life—the whole story, replete with all the plots and executions. He also made it plain that the Sublime Porte's permits and letters were of no value in the Levant.

"I," he said, "am the Lord and Master here and you are under my protection."

If Buck Whaley had any doubts about his host's reputation, an incident involving a gardener soon dissolved them. There were, he wrote, 300 gardeners working in the gardens around them and one of them accidentally broke the stem of a valuable plant. The Pasha, his eyes ablaze with savage fury, immediately ordered the wretch stripped and bound to a bar of wood. Then, before Whaley's horrified eyes, he took a silver hammer and had raised it to break the gar-



THE GOVERNOR'S VILLA.

dener's back when Buck intervened.

For some reason the Pasha accepted Whaley's intercession and even agreed to spare the man's life. Furthermore, to make up for his display of fury, he suddenly announced that he had a special treat for his visitor. He clapped his hands and to Whaley's astonishment there appeared a procession of more than 100 women, all garbed in white and veiled from head to foot. It was al-Jazzar's harem!

With this supreme mark of esteem the ruler gave Buck his blessing and sent him off to Jerusalem marvelling at the ways of the East.

As they rode along the road to Nazareth, en route to Jerusalem, Buck and his friend were amazed to see an abundance of game. They were also surprised to learn that despite the protection of al-Jazzar, bandits still might attack them. To avoid such an attack they traveled the final stretch of road from Nablus to Jerusalem during the night, arriving at last before Jerusalem's gates.

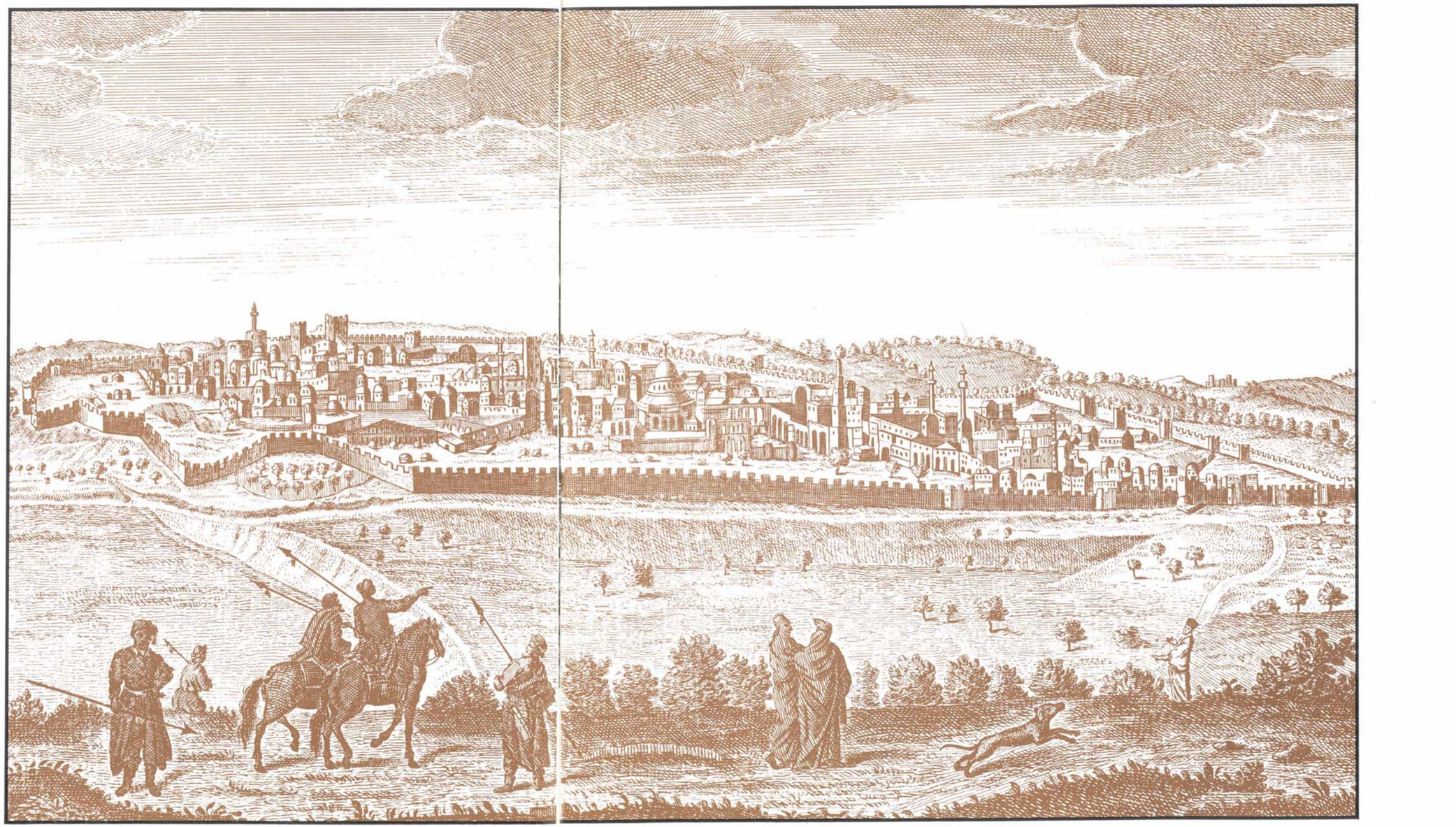
Unlike most pilgrims to Jerusalem, Buck Whaley did not have to worry very much about suitable quarters in the Holy City. Armed with a letter from the Spanish ambassador in Constantinople, he put up at the Convent of the Terra Sancta and set out to explore Jerusalem. And unlike his explorations at Smyrna and Constantinople, those in Jerusalem were beyond reproach. He went to all the Holy Places, questioned his guides rigorously, drew a map of the city and even wrote careful descriptions that showed an unexpected intellectual turn of mind. Then, having first secured a signed certificate from the Superior of the Convent that he, Buck Whaley, had come to Jerusalem, he began the trip home.

The return voyage did not compare with the first phase. At Cyprus Buck did meet another girl, but instead of conquering her he fell in love with her and even contemplated marriage. But since to a "slave of passion" and a "votary of licentiousness" the idea of marriage was "no less horrible than self-destruction," he went on instead, to France. Then via Paris and London, he returned to Dublin and triumphantly collected his fantastic winnings.

In a way the arrival in Dublin was the climax not only of the trip but of Buck Whaley's life as well. Except for one more extravagant wager he never again did anything of note and at 34 died of a chill. The bet was that he could live on Irish soil without living in Ireland. He won it by shipping enough Irish earth to the Isle of Man to provide a foundation for a mansion. It was called, accurately, "Whaley's Folly," and it stands to this day as the Fort Man Hotel. But the only trace of the swaggering buck who built it is a small bar called the Buck Whaley Room where, possibly, an occasional traveler may raise a glass to the memory of a spectacular man of a spectacular century.

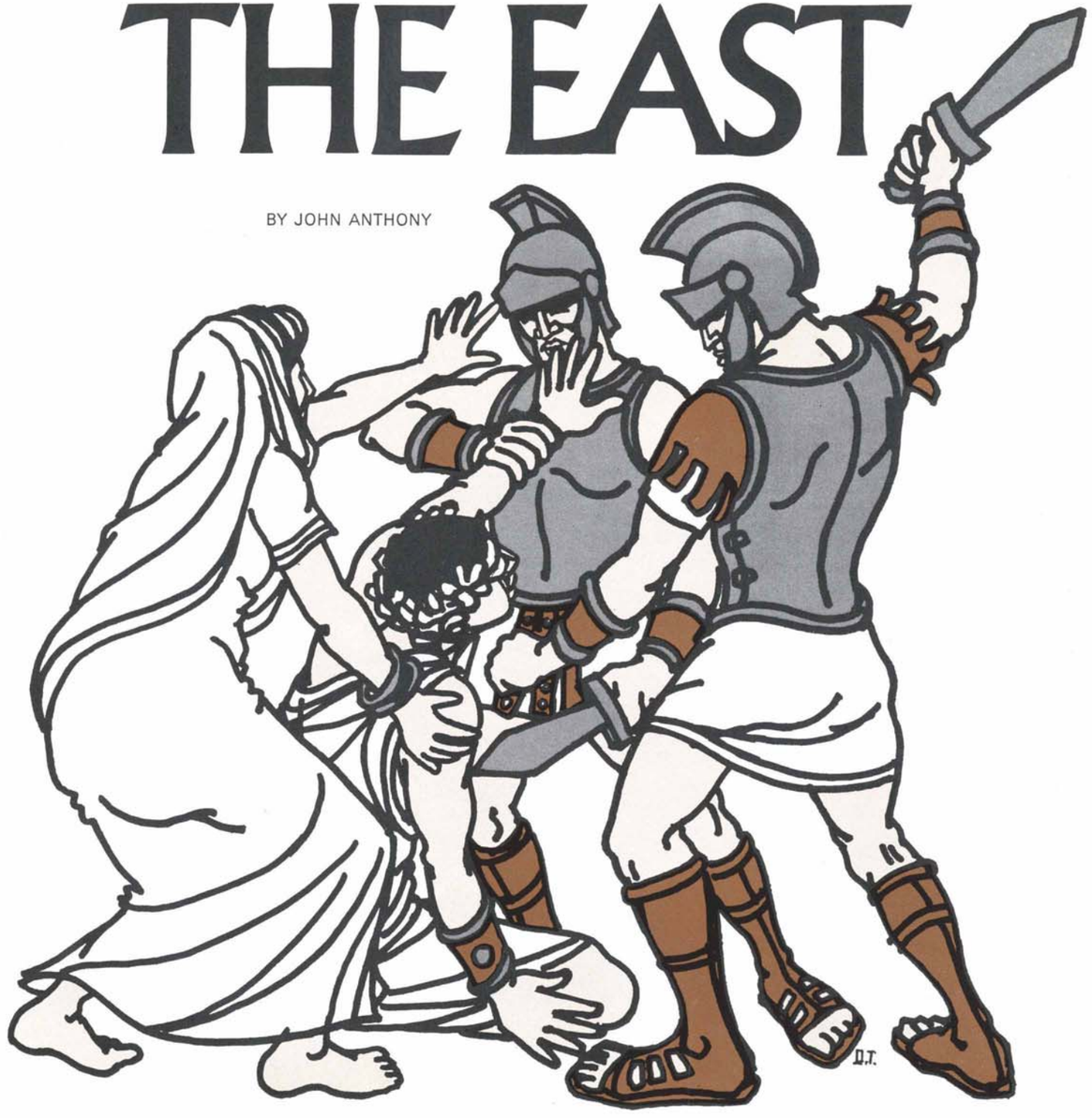
John Brinton, a collector of rare books on the Middle East, has contributed to several reviews. This is his second article for Aramco World Magazine.

THE CITY OF JERUSALEM.



EMPERORS FROM THE EAST

BY JOHN ANTHONY



From ancient Syria they came-to Rome and the seat of power...

"The Orontes of Syria has long flowed into the Tiber, bringing language and manners in its flood."

These words were written by Juvenal, the Roman satiric poet, near the beginning of the second century after Christ. Syrian fashions, religions and arts were popular in Rome, and the streets of the imperial city were familiar to Syrian merchants, artisans, slaves, and philosophers. For when Rome conquered the East, it was not a case of bringing civilization to the barbarians, as she had done in western Europe. The countries of the East—Egypt, Syria, Babylonia—looked back on histories much longer than Rome's and civilizations stretching back unbroken for as much as three thousand years. Rome in fact borrowed as much from the East as the East took from her. But even Juvenal might have been surprised to know that in the following centuries the Roman Empire itself would be ruled at times by Syrian and Arab emperors.

The Syrians came into the picture in a rather roundabout way. At the end of the second century, the imperial throne fell vacant for four years while various contenders, each backed by different elements of the army, struggled to seize power. The victor was the commander of troops on the Danube frontier, Septimius Severus, a native of Libya who was married to a Syrian woman. He spoke Latin badly, preferring the language of his Phoenician ancestors. He was capable, intelligent, and ruthless, and he had a crystal clear idea of what he wanted to do: destroy the old ruling class of senators and seize autocratic power for himself and his descendants. With the help of the army he set out to do so, first by killing all who had fought against him for the throne, and then by launching a calculated campaign to de-Romanize the Empire.

To downgrade the status of Italy, Severus dismissed all Italians from the elite Praetorian Guard and filled it with soldiers from his own nearly-alien legions. To weaken the rich and powerful landowners, he either imposed confiscatory taxes or requisitioned property outright—then gave money and goods to the army. He showered favors on Leptis Magna in Libya, on Syria as his wife's home, and on the Danubian provinces, the home of his soldiers. On his coins he proudly displayed Africa as his place of birth.

To achieve all this safely he required the loyal support of the army, and this Severus secured by lavishing privileges upon it and making it the most powerful class in the Empire. He increased the number of troops, raised the soldiers' pay, allowed them to marry, and gave them generous benefits on discharge. Officers were promoted from the ranks, and the path to important government posts was through the army. Furthermore, he remained a commander of troops throughout his 18-year reign, and personally led campaigns against the savage Scots in the north and the Parthians in the east. He built roads and fortifications in the frontier provinces and added another province in the East, Mesopotamia, to the Empire.

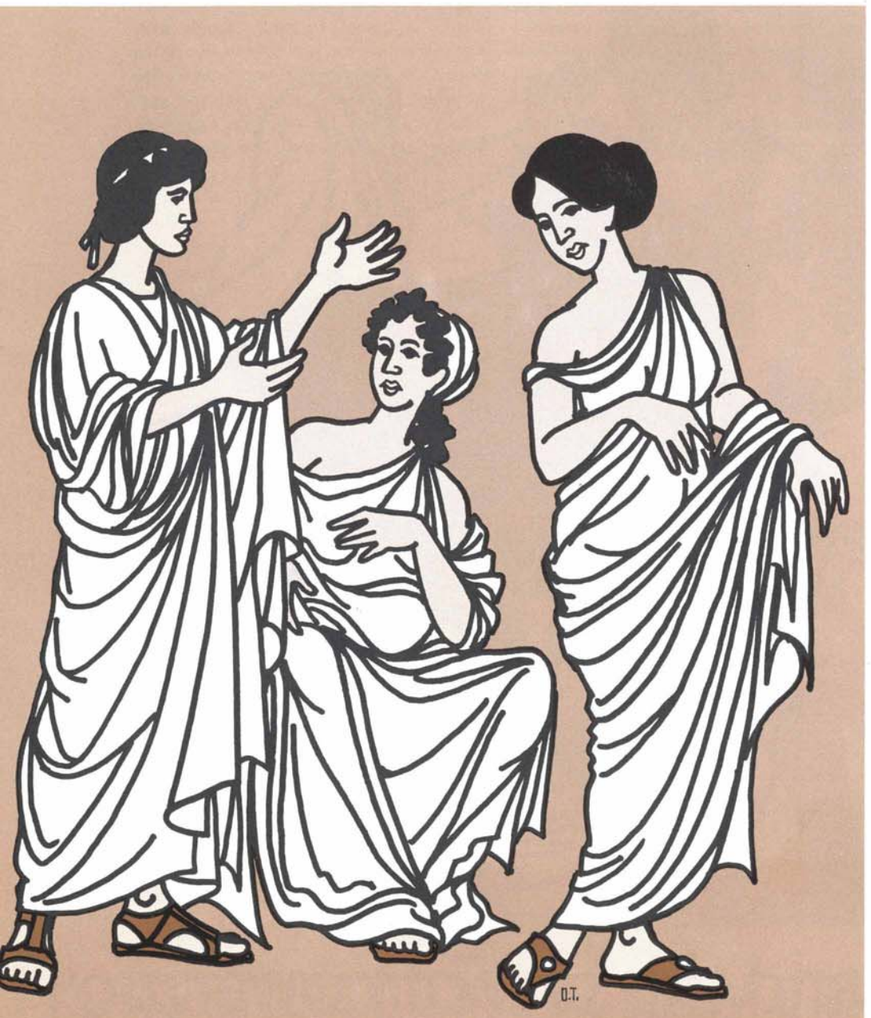
As a result of such favored treatment the soldiers naturally worshipped Severus and since they came from the poorer classes, he won the support of the peasants and proletariat as well—a fact reflected in the laws enacted during his reign, laws that favored the poor and weak over the rich and strong, and that developed an ideal which we still cherish: the equality of persons before the law. In gratitude the common people raised statues of Severus and of his wife and sons.

Julia Domna, his wife, was princess of the native dynasty of Emesa (the modern town of Homs in Syria). Strong-minded, intelligent, and highly educated, she supported Severus in his programs and traveled with him on his expeditions. It was at Antioch, capital of the Roman province of Syria, that they celebrated the coming of age of their elder son, later to be called Caracalla, who from then on was associated with his father in the government. Their younger son, Geta, was given the title of Caesar, which at that time meant that he was also heir to the throne. By such methods Severus hoped to insure that his sons would share the Empire and rule it together when he died.

Caracalla and Geta, however, hated each other intensely. Thus when Severus did finally die—the last emperor, incidentally, to die a natural death for many reigns to come—the brothers raced across Europe, each hoping to seize Rome first. On arrival they divided the city between them, forbidding any communication between the two parts. In trying to bring them together, Julia arranged a meeting in her apartments—at which two soldiers brought by Caracalla fell upon Geta and killed him in his horrified mother's arms. Caracalla put out the story that he had acted only in self-defense and was accepted as sole ruler by the army.

Caracalla continued his father's policies of militarization, but in exaggerated form. "Nobody," he said, "should have any money but me, and that to give to the army." So by extortion and confiscation he seized the wealth of the rich and gave it to the soldiers. He acted like a common soldier and tried to look like one, cutting

ILLUSTRATIONS BY DONALD THOMPSON



his hair short and wearing, instead of the Roman toga, a long coat from Gaul called a caracal, from whence his nickname. His health was poor, undermined by debauchery, so Julia Domna had at times to rule in his name. He was nervous, suspicious, and a little mad. He thought that the ghosts of his father and brother came back to torment him; to erase reminders of his guilt, he ordered all images of Geta—statues, coins, or any other form—to be destroyed. Perhaps his greatest crime was the massacre of the entire youth of Alexandria, for some real or imagined slight to himself or to the army which was quartered there. In the fifth year of his reign he was murdered by an ambitious officer of the Praetorian Guard named Macrinus. Julia Domna died soon after of an illness—or suicide.

Macrinus did not last long. The legions refused to accept him and hankered for another Severus. At Emesa in Syria, a plot was hatched to give them one. Julia Maesa, a sister of Julia Domna, had a daughter, Julia Soemias, a widow with a 14-year-old son. The story was put out that the boy was in fact the illegitimate son of Caracalla; the legions rallied to him and soon disposed of Macrinus.

The new emperor was a priest at the temple of the Syrian sun god, Elagabalus. Although he was hastily given several Severan names, he preferred that of his god and is known to history as the Emperor Elagabalus. In fact he took his priestly duties more seriously than his imperial role, and transported to Rome the sacred conical stone representing the sun god, which he tried to install in place of the ancient state gods of Rome. Though young in years, Elagabalus was already accomplished in depravity, and while he immersed himself in idolatry and vice, his mother and grandmother, the two Julias, quietly ruled the Empire. After four years, even the broad-minded Romans were shocked and disgusted, and the Praetorians killed both Elagabalus and his mother.

But old Julia Maesa was not so easily beaten. She had another daughter, Julia Mammea, who also had a son. The word went out that he too was a bastard of Caracalla, and again the army rallied to the memory. Severus Alexander, as he was pointedly renamed, was of a completely different stripe from his cousin. Industrious and amiable, he was involved in no scandal. Still, he was not a strong emperor, allowing his mother and her advisors to rule for him even after he came of age. Their policy was to revive some of the power of the senate to counterbalance that of the army, and they were partly successful. The 13-year reign of the young Syrian was a return to sanity. But eventually the army had the last word again. When Severus Alexander tried to buy off some German tribes instead of fighting them, the Roman troops mutinied and killed him.

In the six years following the death of Severus Alexander, six emperors were created and then destroyed. The army was spoiled and soft, no match for the barbarians who battered at the frontiers, yet all-powerful in the business of making and unmaking emperors. Civil wars raged; the population declined, farms were abandoned, trade stagnated. When the Persians, a new power in the East, captured the province of Syria the loss jolted the Romans, and under the Emperor Gordian III they rallied and pushed the Persians back. At the moment of victory, the troops reverted to their usual behavior, murdering Gordian during a bread riot. History has not decided whether his successor had a hand in the assassination.

This man was Julius Verus Philippus, son of an Arab shaikh of the Hauran (now the Jebal Druze region in southern Syria), known to history as Philip the Arabian. After his acclamation by the troops, Philip negotiated with the Persians, granting them Mesopotamia but restoring Syria to the Empire. Then he hurried to Rome with his son and there sought and received acceptance by the senate. Philip had the makings of a good emperor for his times. Although he owed his elevation to the army, he tried to curb its power and to restore the authority of the senate. He won an armed victory over Danubian barbarians and shortly thereafter raised his son to the rank of Augustus to share in governing the Empire. Philip did not forget his native Hauran; the village of his birth was rechristened Philippopolis (today's Shahba) and adorned with temples, palaces, and a theater which can still be seen in graceful ruin.

The great event of Philip's reign was the thousandth anniversary, in A.D. 247, of the founding of Rome. Philip celebrated it in magnificent style, perhaps the more so because he was an alien. Religious and patriotic ceremonies were climaxed by circus games for which an unheard of number and variety of wild animals were imported from all over the world. The wealth and power displayed must have led Philip and the people of Rome to believe that the Empire would last another thousand years.

But hardly a year later the Goths invaded the northern frontier and rival pretenders appeared both on the Danube and in the East. Philip sent his ablest general, Decius, to quell the disturbance on the Danube, but the army, angered by Philip's attempts to control it, gave Decius the choice of being made emperor or being assassinated. He chose the former and, instead of heading his troops against the Goths, marched back into Italy. At the battle of Verona, where one part of the Roman Army fought against another, both Philip and his son were killed.

The lives of the Roman emperors have fascinated and amazed the world by their display of extreme emotions, of power unchecked by principle. The stories of the eastern emperors may seem a senseless repetition of hatred, treachery, butchery, and lust for power. But they are part of a historic process called the decline of the Roman Empire. As it declined from what it was, the Empire was also evolving into something else, and the reign of each emperor was part of the new development. The very elevation of these foreigners to the imperial purple showed that the Empire was no longer merely Roman but universal, and that its base was no longer the subjugation of other peoples but the freely accepted patrimony of all. More specifically, the origin of these men was part of that eastward drift of the center of gravity of the ancient world, a drift that culminated in Constantine's removal of the capital to Constantinople and the transformation of the classical, pagan Roman Empire into oriental, Christian Byzantium.

John Anthony, a regular contributor to Aramco World Magazine, *is currently working on a full-length book on Roman Syria.*

PLAGUE ACROSS THE LAND

BY DANIEL DA CRUZ

"...And they shall cover the face of the earth, that one cannot be able to see the earth, and they shall eat the residue of that which is escaped... and shall eat every tree which groweth for you out of the field. And they shall fill thy houses."

No one who has ever seen the locust at work accuses the Biblical account of hyperbole. In 1926-27, small swarms of the African Migratory Locust were spotted in an area 50 by 120 miles on the plains of the River Niger near Timbuktu. The next year swarms invaded Senegal and Sierra Leone. By 1930 the whole of West Africa was flailing away at the pest with everything movable. But the locusts didn't seem to notice; swarms reached Khartoum, more than 2,000 miles to the east of Timbuktu, then turned south, spreading across Ethiopia, Kenya, the Belgian Congo, and, in 1932, striking into the lush farmland of Angola and Rhodesia. Before the plague finally sputtered out 14 years after it began, it affected five million square miles of Africa, an area nearly double the size of the United States.

The locust is perhaps nature's most awesome example of the collective destructive power of a species which, individually, is practically harmless. An adult locust weighs a maximum of two grams—it takes over 225 to outweigh a can of beans. But since each locust can eat its own weight daily, and since a moving swarm may carpet the ground with anywhere from 30 to 60 locusts a square yard, a square mile will typically contain from 100 million to 200 million of the creatures. Seldom, furthermore, will a swarm occupy a mere square mile; swarms more than 400 square miles in area have been recorded, and one that size weighs more than 80,000 tons. It numbers around 40 billion insects eating the weight of the *Queen Mary* every day it is on the move—and it never stops. Even the two tons of locusts each one million population represents takes a tremendous toll: each day that population eats as much as 20 elephants or 500 people. And their voracity is not only in numbers; pound for pound the locust eats 60 to 100 times as much as a human being.

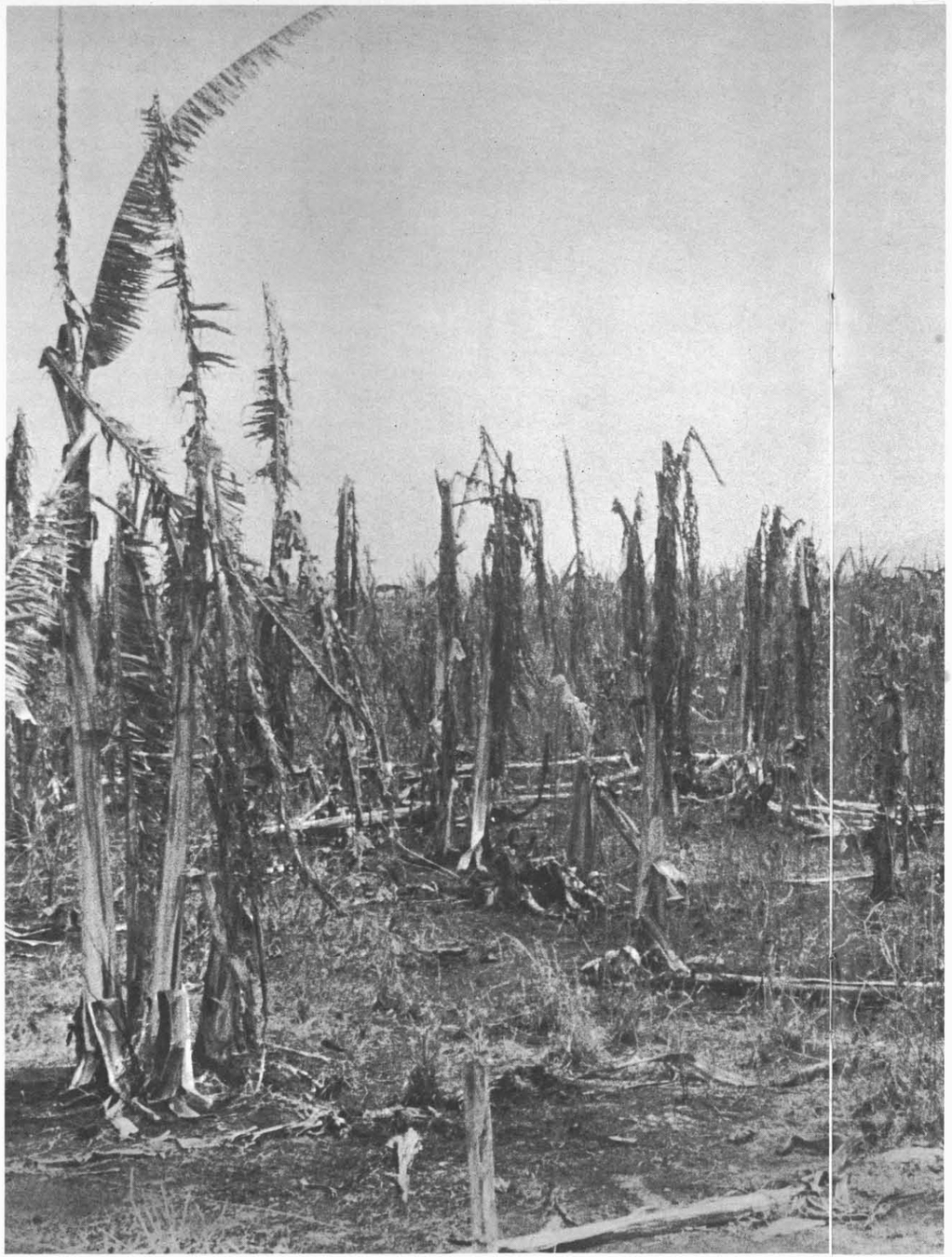
The ubiquity of the locust makes eradication of the pest about as easy as emptying the Atlantic with a teaspoon. Destructive grasshoppers and locusts infest most of Africa, central and western North America, about half of South America, the Arab world, Australia, the Indian subcontinent, and a broad band across Central Asia. One of the three main species, the Desert Locust, may invade 11 million square miles, more than 20 per cent of the world's land area. The African Migratory Locust is so far confined to Africa below the Sahara. The Red Locust, third of the terrible triumvirate, breeds unobtrusively in a section of Mali and Niger, then breaks out in swarming billions into an area 400 times the size of its breeding grounds.

For all their economic importance in large areas of the world, there is considerable confusion about what a locust *is*. In the United States, the name is frequently used interchangeably for grasshopper, locust, and the cicada. The cicada is not properly a locust at all, but the locust's relation to the grasshopper

is real, in that they both belong to the superfamily *Acridoidea*. Locusts may be defined as grasshoppers which have the capacity to change their habits and appearance when they congregate in dense groups. These groups are called *bands* when composed of young wingless locusts, and *swarms* when of adults that fly. In the Arab world, the two most important species are the Desert Locust *(Schistocerca gregaria)* and the African Migratory Locust *(Locusta migratoria migratoria)*. A further distinction—a frustrating one that keeps locust control officers on the hop—is that unlike all other species, the Desert Locust has no permanent outbreak area, and can spring from practically any soil.

The locust passes successively through the stages of egg, hopper and adult, with maturation occurring between two to four weeks under optimum conditions of temperature and humidity, and as long as six months during periods of drought and low temperature. A female lays her eggs in soil damp enough for her to thrust her ovipositor two inches straight down into the earth, where she deposits a cylindrical cluster, or pod, of eggs in about two hours. A female can lay nearly 200 eggs in two or three pods, and where swarms come to earth to lay their eggs, the field may extend many square miles. The incubation period between laying and hatching is quite variable: between 10 and 14 days during summer breeding in Ethiopia, to 25 and 30 days spring breeding in the Arabian Peninsula, to 60 and 70 days winter breeding in Iran or northern Syria and Iraq in very cold weather.

Young hoppers burst from their shells around sunrise and at once shed a thin white skin. The next day they begin to feed, and, as they grow, to shed at intervals the tough carapace that restricts each phase of their growth. One growth stage succeeds another until the final moult when the hopper becomes a fledgling adult. Its length stabilizes at from two to three inches, but to achieve its adult weight of two grams the hopper has already eaten 10 times that weight—and it is only getting warmed up, for as an adult it can fly to get its food while as a nymph it could only hop. Flying or hopping, the locust will have but brief glory: its life span typically covers 14 days as an egg, 38 days as a hopper and 75 days as an adult, still time enough to consume 170 times its weight.



In what was once a Honduran banana plantation, only a harvest of desolation remains after a locust swarm has passed. Locusts infest much of the western hemisphere.

When hoppers occur in large numbers as a result of favorable weather conditions in localities of swarm breeding, they form bands which move as a unit. Bands of the Desert Locust, for instance, spend the day marching in a definite direction—usually downwind—feeding as they go. When the temperature is above 97° F., around midday the band roosts off the ground on rocks or bushes, and if the weather is very hot the locusts' siesta may last as long as four hours. Thoroughly rested, the hoppers resume their march until nightfall, when they seek foliated perches above ground for their heavy meal of the day, and sleep on the denuded remains of their feast. Unlike an army, whose progress slows as it grows, the bigger the band the faster it moves. Some bands can transform green fields to brown stubble at the rate of one linear mile a day.

Compared with the adult, though, the hopper is a slow-moving country cousin. Locusts on the wing are marvels of stamina. Indeed, locusts hold the flight endurance record for insects by a wide margin. Wind tunnel tests show that they can flap their wings non-stop for 17 hours, and in nature they may be able to fly at a cruising airspeed of 10 to 12 miles per hour for 20 hours or more. Gliding on thermals like sailplanes, they can stay in the air even longer and thus make incredibly long journeys, such as the confirmed 1954 flight of a swarm from the Canary Islands to the British Isles, a distance of 1,600 miles. Old sea stories have it that in such flights some locusts land in the water to make a platform on which the others rest and from which they take off, but confirmatory evidence is lacking. Like planes, they take off and land into the wind (and in high wind take shelter), aided by a low weight-to-body-area ratio and wing-root muscles which at normal working speed outperform 10 to 20 times human muscles working at top speed.

When the hoppers emerge as winged adults, the bands become swarms with vastly increased mobility, and an average density of around 130 million per square mile. Adulthood brings a change in living patterns, too. The Desert Locust, for example, roosts from an hour after sunset until sunrise, and for the first half hour of the day is a slugabed, up but not around. Two hours of aimless milling and short flights apparently starts their blood circulating, and at about nine o'clock they take off on the rising convection currents boiling off the desert. Until sunset the swarm is continually airborne, with locusts on the leading edge coming down to rest and feed while the main body of the swarm passes on overhead, after which they rise again into the air at the trailing edge of the swarm, creating the effect of a giant millstone grinding its way across country.

Depending on wind conditions, collective movement ranges from a few miles to more than 60 miles daily. As swarms fly mostly downwind, weather maps showing wind currents help locust control missions predict the areas where swarms are most likely to converge, and thus where their efforts at extermination of the insect will be best repaid. When they fail, trying times are ahead for any living thing lying in the swarm's path. Long-time Kuwait resident Col. H. R. P. Dickson told of an invasion of the Red Locust which advanced on a five-mile front so dense that even metal screens failed to keep them out of houses. For days, the locusts ate everything in sight. They chewed through carpets and upholstery, Colonel Dickson reported. Even dishes at dinner "were served with dead *dibbas* disconcertingly floating about the gravy or imbedded in the rice." Several thousand sheep, deprived of fodder, died of starvation, but wild animals, camels and dogs waxed fat on a nourishing diet of Red Locusts.

In Saudi Arabia, an Indian team poisons young locusts.

Locusts of the same species are so differentiated in response to environment that until Sir Boris Uvarov disproved it, in 1921, they were considered distinct species. Desert Locusts in one phase, for instance, are relatively long-lived, lay over 90 eggs per pod, develop slowly, never form groups or march in concerted fashion, move no more than a few yards daily, and often fly at night. The same species in another phase usually lay 80 eggs per pod, are short-lived, develop quickly, form dense groups that march in concert, move up to a mile a day, and fly mainly by day in the adult stage.

Appearances are similarly misleading. *Locusta migratoria migratoria* solitarious hoppers are green while their gregarious phase are orange and black. Organs vary in size and shape between the two phases, and using indices computed from differential measurements which show that changes from one phase to another are beginning is one of the principal methods by which scientists are alerted to the imminency of a plague. Other than by this means, locust control authorities are practically powerless to predict where

PHOTOGRAPHS BY COURTESY OF THE FOOD AND AGRICULTURAL ORGANIZATION OF THE UNITED NATIONS (FAO). ALSO BY AHMAD MENTAKH.

A locust invasion in Morocco, November, 1954. Individuals crushed by the car were immediately devoured by the cannibalistic survivors; more normally locusts attack vegetation, animal fodder and man's crops, in great swarms of up to 40 billion insects carpeting the ground for 400 square miles, eating more than 80,000 tons each day and stripping the land bare.

they will appear. How long a plague will last and the amount of destruction it will wreak are similarly mysteries, although the amount and distribution of rainfall and weather in general are fairly well implicated in the overall pattern of locust plagues.

Fortunately for mankind, plagues die out sooner or later even when food is plentiful, but the explanation for the disappearance of the swarms is as obscure as the mechanism which starts them in the first place. Though morphologically locusts have extreme phases, the changes follow a circular pattern, from solitarious through a congregating phase into gregarious, then through a segregating phase back again to the solitarious. Just what triggers each change is something any biologist would give up a sabbatical counting grass skirts in Tahiti to discover.

Meanwhile evidence is piling up, much of it statistical, which provides valuable clues to the dynamics of locust behavior. Two thousand records of locust invasions show that 8 per cent of the damage is done by hoppers, 69 per cent by fledgling and maturing swarms, and 23 per cent by mature swarms. Sixty-six pounds of pasturage per acre may be lost in a single day—catastrophic in areas of thin cover like the Middle East—and when the locusts mount trees to graze and rest, their combined weight often brings the defoliated tree crashing to the ground. Records also show that plagues are more common than the layman appreciates: over a 25-year period, Desert Locust swarms were reported from 18 to 23 times annually around the southern rim of the Arabian Peninsula—as high an average as found anywhere in North Africa and Southwest Asia where this locust occurs, and hopper infestations were reported an average of 12 to 19 times a year for the same area.

Mankind no longer mutely accepts its fate, but fights back with a whole arsenal of weapons. The metaphor is apt, because in most respects human warfare has a precise analog in locust control. Intelligence is the first requirement; for reporting of conditions which are favorable for the development of the swarms. The second requirement is an efficient transport system, coordinated by a tight-knit organization capable of crossing national boundaries at will. The third is a wide spectrum of poisons, each tailored to specific conditions. The factors of cost, transport, and killing power versus safety must all be considered in selecting the biological warfare agent. DDT, for example, is cheap but doesn't bother locusts particularly. Dieldrin is potent, but toxic to animals and man. Aldrin is cheap and less toxic than dieldrin, but less persistent. Diazinon kills the adult Desert Locust efficiently but little affects hoppers; on the other hand, it is not very toxic. The Parathion family is the cheapest and most deadly of "locusticides" known, but it is hazardous to mammals. Ultimately, the battle against the locust is fought on terms familiar to defense departments everywhere: kill the largest concentrations first, by the cheapest method possible, so as to get the most killed for the least money.

A further decision is whether to fight on the ground or in the air. Meal or bran mixed with poison is effective, but it takes considerable time and truck transport, both disadvantages in remote areas. Dusting requires that the dust falls on the food or the locusts themselves; wind or air turbulence can thwart dusting, but it is cheaper and faster than baiting. Air spraying covers large areas quickly, and even flying swarms (which can be seen up to 60 miles away by aerial spotters) can be effectively attacked by releasing a curtain of spray through which the downwind-flying swarm must pass. A typical attack on a flying swarm might call for a flight altitude from 300 to 500 feet above ground over the densest part of the swarm, starting at one hour before sunset, on a course 90° to the prevailing wind, spreading 16 gallons per minute of 15 per cent gamma-BHC in oil.

The Eastern Province of Saudi Arabia has long been a battleground in frequent assaults against the Desert Locust, since the area was a springboard for airborne invasions of the Indian subcontinent. An Indian mission launched major control efforts in the spring of 1958 and again in 1961 and 1962 when eruptions of the locust threatened to spill across the Indian Ocean. With logistic support from Aramco's Aviation Department, a 21-man locust control team fielded a task force from al-Khobar into the rural regions where locust eggs were reportedly hatching. Eight trucks, six power dusters, two power sprayers and 100 hand dusters distributed 50 tons of BHC as dust, spray, and as food bait in the path of the hoppers. The campaign was not entirely successful, for farms around Hofuf were hard hit, the locusts stripping vegetable plots and even attacking the usually untouched leaves of tall palms. Unquestionably, however, the Indian anti-locust teams dulled the aerial spearhead aimed at their homeland by tackling the menace before its momentum became irresistible.

In any case, the locusts do not always have things their own way. Frost decimates their ranks, and high, dry heat will kill them off when shelter isn't available. Too much rain will rot their egg pods or wash them away, and young hoppers can drown in the flash floods that occasionally rip through desert wadis. Wasps and flies destroy many eggs, sometimes eating them or planting their own larvae on them as a future off-the-shelf food supply. Locusts are also cannibalistic, especially in conditions of low humidity. Ants, birds, and other predators from foxes to snakes eat locusts, but despite their voracity make a very small dent in the swarms. Bustard have been shot down with up to 130 hoppers in their stomachs, kite with as many as 168, and European storks with nearly 1,500. The all-time locust-eating record belongs to the Abdim stork, one of which was killed with the remains of 3,481 locusts inside. This suggests a simple solution, but for one complication: what happens to the already soaring human population with so many storks flying around?

Daniel da Cruz, who makes his home in Beirut, is a novelist and Middle East correspondent for a large news agency.

PHOTOGRAPHY BY SA'ID AL-GHAMIDI

Off to the great outdoors they went... and went... and went...

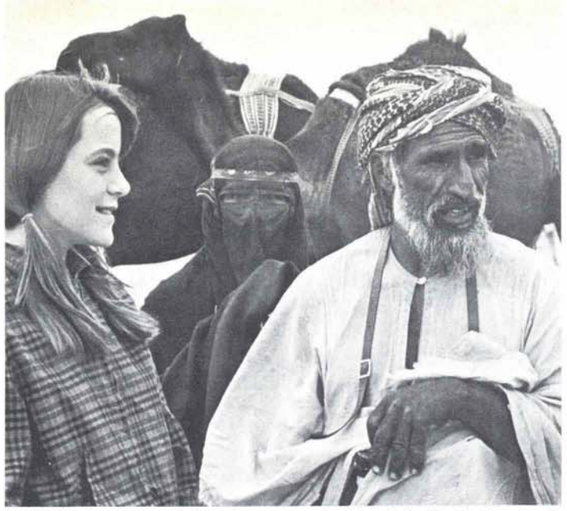
CAMPING IN THE EMPTY QUARTER

BY BRAINERD S. BATES

It was the start of spring vacation and Kevin Mandaville, a second-grader in the school just across the street, was helping his father pack the family car for a trip. Kevin's brother Erik (known to all and sundry as Riki) was an attentive watcher. He wanted to help too, but most of the stuff going into the back of the car was plainly too big for a four-year-old to handle. Those cartons of canned food weighed plenty; so did the canvas tarpaulin and the fitted wooden chests holding Daddy's radio equipment, Coleman lamp and scientific paraphernalia. The boys' mother made a final check around the house to see that nothing had been left behind. She well knew that in the Rub' al-Khali, where they were going, there would be no shops to sell them forgotten needs.

The Rub' al-Khali is an area bigger than the state of Texas, covered by rolling sand dunes and—as viewed from the air—nothing much else. The Bedouins have been crisscrossing this lonely territory for centuries, but not until 1931 had any Westerner traversed the desert called — with reason — the Empty Quarter, a part of the Arabian Peninsula on which it almost never rains, where midsummer temperatures have been officially recorded at 126° Fahrenheit, and across which, in the spring, sand-carrying *shamals* out of the north are known to blow for 40 days without stop. It was to a selected point just north of the center of this inhospitable piece of real estate that the Mandavilles, I, my wife Joanne and my daughter Claudia were headed.

To geological field parties of the Arabian American Oil Company (Aramco) the Rub' al-Khali has long been familiar ground. Oil explorers have been covering those parts of the Empty Quarter situated within the company's concession area for years. While in the field for weeks at a time they live in reasonable comfort in mobile trailers specially fitted out for sleeping, eating and showering. The makeup of these parties, it goes without saying, is strictly stag. We were, as far as we knew, the first Americans to drive their own vehicles—Land-Rovers—deep into the Rub' al-Khali as a family group with children, camping out in the open



For Claudia, the camping trip is a chance to meet a Bedouin family at a desert well.

all the way. Let me point out here and now that it ought not be attempted except under severely circumscribed conditions —which means, in simplest terms, adequate support and qualified leadership.

The support so essential for our undertaking stood on six 1400×20 sand tires—a Kenworth bobtail (rated capacity: 10 tons) which, with its driver and driver-helper, Aramco had assigned to us for the trip's duration. Men in the company experienced in such calculations took into account the number of people in our party, the distance we expected to make and the time required to cover it, figured with plenty of margins for safety the quantity of water and fuel we would need, and recommended the kind of truck that would be big enough to transport that amount of liquid translated into pounds. It added up to quite an impressive total: the Kenworth drove out of Dhahran's Main Gate that departure Saturday bearing six 55-gallon drums of water, five 55-gallon drums of gasoline, plus sufficient diesel fuel to power its own engine. In addition, the support truck carried all of our sleeping bags, folding cots, the Arab crew's camping gear, much of our food, and a few tamarix-tree logs I'd been saving under the impression that our camp sites would be barren of cooking fuel. Some time before, Claudia had made a pair of stilts nine feet tall on which she often walks around town, getting a camel's-eye view of Dhahran—and some double takes in the process. When she saw there was room in the truck, with typical teen-age impulsiveness Claudia decided her stilts would have to go along, too.

Choosing one's companions for a trip into trackless desert holds much the same hazards, I am convinced, as selecting shipmates for a long cruise. Those who possess the right combination of know-how, experience and enthusiasm to carry their weight during either mode of travel are rare. In a way, Jim Mandaville has been preparing for the trip we were about to undertake most of his life. He first saw Saudi Arabia at the age of 13, when his family took up residence in Ras Tanura, the Arabian Gulf refinery and marine terminal town just north of Dhahran, where J. P. Mandaville, Sr. still works for Aramco. In that seaside community, with broad beaches close at hand, Jim cultivated a boyhood interest in collecting specimens of snakes, lizards and plant life. The youthful hobby was to grow into a serious adult avocation, and its pursuer to become an authority on desert natural history, sending his finds—pickled, skinned or pressed—to museums all over the world. His main purpose in going to the Rub' al-Khali, a trip he was making on vacation time, was to bring back more examples of flora and fauna for categorizing.

During his Ras Tanura days Mandaville was one of a handful of youths to take advantage of the Arabic lessons the company offers to American employees and interested wives. Jim continued to hear much Arabic spoken in Lebanon, where he entered the American University of Beirut with intentions of becoming an electrical engineer. After two years at A. U. B. an interest in *hamzat* and *harakat* won over volts and amperes and Mandaville transferred to Georgetown University in Washington, D. C., for full-time Arabic studies. At Georgetown too, he met his future wife, Lotte, daughter of a German diplomat stationed in the American capital, who was concentrating in European languages at the university. Lotte Mandaville's own Arabic, she says, was learned largely during her employment as a secretary at the Sudanese Embassy in Washington.

Competency in the language of the Middle East was an essential ingredient to bring along, even though we would be traveling through territory which seldom hears human voices speaking any tongue. After all, the two members of our party who would be showing us the way did not speak a word of English. Other assets were Jim Mandaville's intimate knowledge of the geography of the Arabian Peninsula and his long-time interest in amateur radio which made it possible for him to keep the outside world informed of our whereabouts daily.

The most significant contribution Jim Mandaville made to our project, however, came out of his acquaintance with Hadban ibn 'Ali ibn Naffah. Hadban is a slight, wiry Bedouin with bright black eyes and the weathered face of a man who is most at home out-of-doors. He belongs to Al Murrah, a tribe whose members are famed for their skills at desert tracking. We were fortunate indeed to have Hadban as one of our two Arab guides. Radios, compasses and proficient vehicles are certainly useful in the Rub' al-Khali, but it still would have been impossible to check off the precisely pinpointed locations we expected to touch in that vast country without the knowledge of its every feature which men of the desert such as Hadban ibn 'Ali carry around in their heads.

We picked up Hadban a few miles outside of Dhahran. His whole family gathered in front of his desert tent home to wave us good-bye. Although we drove on good, hard-surfaced roads most of the first day, Hadban had not been riding in

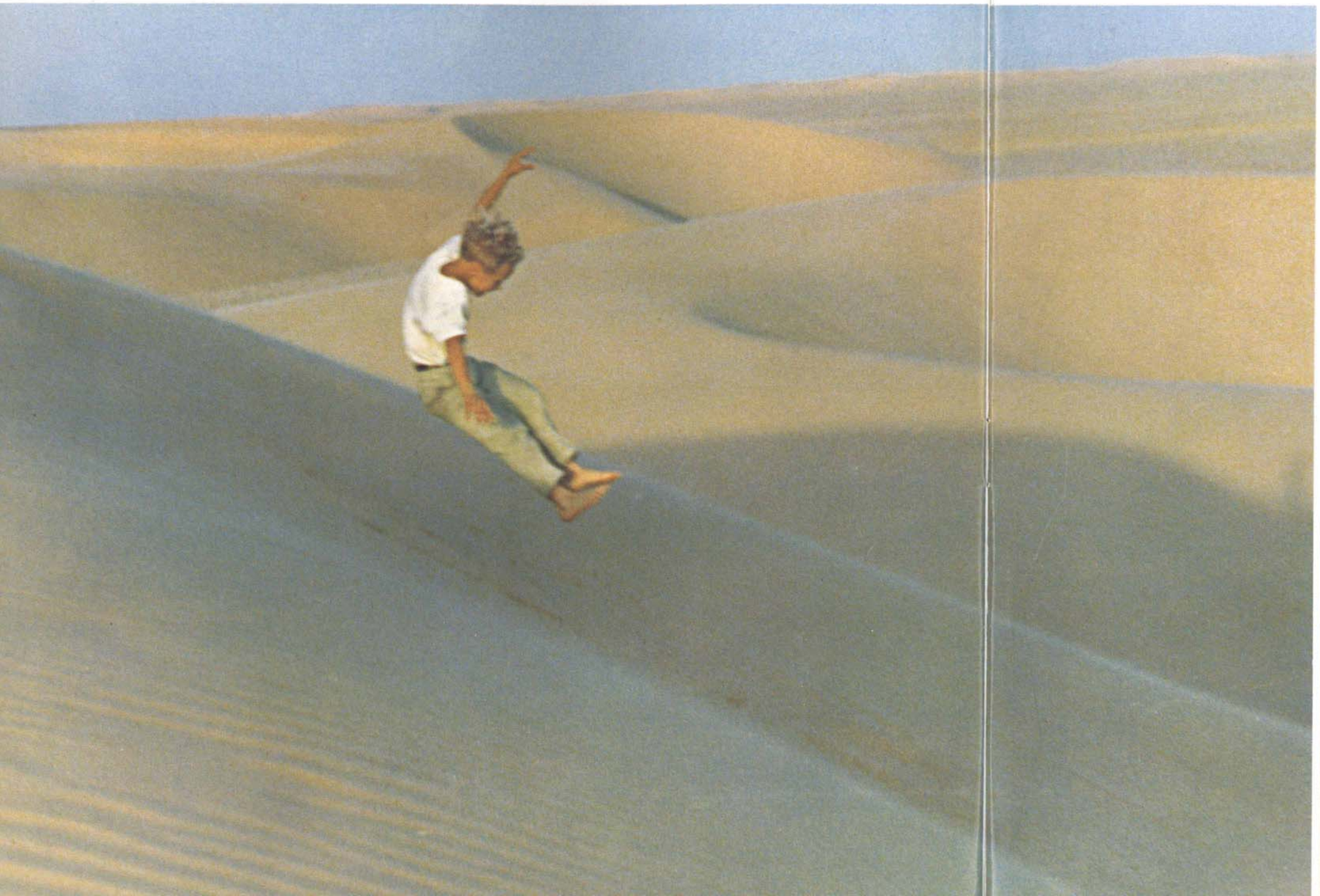
While a young camel nurses from its mother, Kevin Mandaville discovers that the frothy bowl of guaranteed-fresh milk offered to him by a herdsman has a pronounced salty taste to it.

the Mandaville's lead car long before he began to function as a guide. At midday the sun over Saudi Arabia can make the land very hot and glary, even in April, and as lunchtime approached the possibility of finding shade in which to pause seemed remote. But Hadban just happened to know of one cliff with a rock overhang on the left-hand side of the road, half way between Hofuf and 'Udailiyah, and it was under its most welcome protection that we picnicked that first noontime stop. A couple of hours later we had our last drinks of cool water from a refrigerated bubbler in the gatehouse of Aramco's 'Udailiyah camp before heading south in the direction of the Empty Quarter. It would be eight days and 770 miles before our tires touched asphalt again.

The big Kenworth support truck accompanying us was, by its very nature, stronger on power and capacity than on speed, and several times on the blacktop first leg of our journey we had to wait for it to catch up. Now, on the flat, trackless gravel plains which stretch from 'Udailiyah for a great distance west of Haradh the truck seemed in its element. With a direction instead of a road to follow, our three vehicles could spread out over the plain's hard, nature-made surface in a line. The throttle of the truck's engine was wide open now, and the roar of the engine, emitted through the vertical exhaust acting as a stack, was loud and strangely comforting. Under all that thunder driver Abdul Hadi ibn Hadi, wearing the customary red-and-white-checked *ghutra*, secured on his head by a black-rope *agal*, and looking quite small in the huge, high cab, kept his eyes on the "road" with the fierce concentration of a locomotive engineer who has 1,500 horses at his command.

It was deep dusk when we left the gravel plain stretch, and still we kept going. Hadban, now guiding us from my car, continued to give me the signal to move along. Our photographer, Sa'id al-Ghamidi, explained why. Hadban knew where there was fuel for our campfires, and we would push on until we reached that point, somewhere out there in the semi-darkness.

With the size of our party it was not possible to travel lightly, but back in our

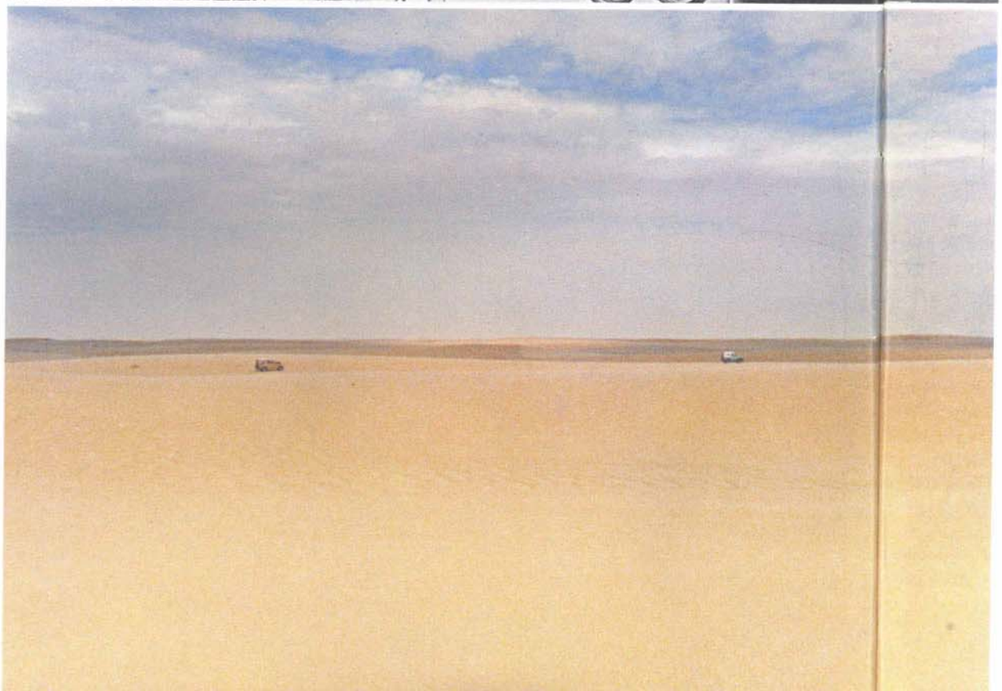


preparation stage we had all agreed at least to travel simply. This meant no cumbersome tents to put up and strike at each overnight stop, and plain meals —out of tin. Even with our camping routine stripped down to barest essentials, however, it took us two or three nights to get it running smoothly. I observed our Arab friends to see how they made camp with such speed, efficiency and seeming lack of effort. While Hadban roamed the campsite area gathering dry desert bushes for firewood, Hadi and his helper, Mutlaq Habib, tossed down from the truck their camping gear—blanket rolls, food and the inevitable utensils for making and drinking Arab coffee and tea. Within minutes after we had pulled up to our campsite the Arabs' fire was crackling and water was coming to a boil.

It was while we were lounging around the embers that first night out, relishing the stillness and peace of the desert, that Hadban suddenly cast his face skyward, began sniffing the atmosphere, made with his arm a broad sweep of the northern horizon, and announced matter-of-factly: "*Hawa*"—the wind. Sure enough it came, about an hour later, in great accelerating gusts out of the night. Our evening meal, heating in a pot on a fancy butane camp stove I had acquired for the trip, was not quite hot yet, and the small blue flame was wholly ineffective against the strength of the wind. Our wives tried to serve the food anyway, but supper rapidly disintegrated into a shambles as everyone grabbed flying debris with one hand while holding onto his plate, fork and spoon with the other.

The wind blew without letup until almost dawn. We were to live with it, on and off, for the rest of the trip. Six out of seven nights it came precisely at suppertime and, with no other choice, we soon learned to accommodate to the pressure of the steady blasts and the ubiquitous sand carried with them. My shiny new stove got stowed in the car for good. Bedouins were using desert bushes for fuel long before butane stoves were ever invented, and we discovered how quickly the thin, dry wood lit, how cleanly it burned and how the wind only fanned the flames into hot, concentrated embers. On *shamal* nights we simply lined up appropriate numbers of opened tin cans against the wood fire,

Each evening, Mandaville transmitted the party's location to Dhahran, so that even as they moved deep into the Empty Quarter (below) they felt in constant touch.



and when their contents were hot ate them directly out of the containers.

By continual experimentation we finally hit upon the means of getting a perfect night's sleep in spite of the constant blowing. Settling Kevin and Riki in was easy. At ages seven and four, the Mandaville boys were already old camping hands, having made numerous field trips by car, including a journey to Kuwait only the week before as a kind of warm-up for the present trek in the opposite direction. They fitted with their sleeping bags very nicely into the back of their father's Land-Rover. For the first couple of windy nights Claudia tried sleeping in the front seat of my car, but she found her length and the car's width were incompatable and wound up taking her chances with the adults out in the open.

The parents in the party tried putting up their camp cots behind their vehicles parked at right angles to the wind for what would seem to make perfect shelters against the blasts. But this plan, we soon saw, had fatal flaws. For one thing, the sand blew *under* the cars as through a wind tunnel. Then, I'd wake up at dawn after the wind had howled all night to see my car tilted at an angle close to the point of no return. The incessant blowing had blasted deep trenches around both windward wheels. We learned to head the two vehicles directly into the gale and unfold our cots far out in front, away from any sand-catching eddies man-made obstructions would be certain to create during the night. Easing into our sleeping bags kept carefully flat on the cots so they would not act like spinnakers, we would push our feet into the zippered enclosures positioned, right into the wind, like ships' bows. Before dozing off I'd take one long look at the sky. Even viewed through a film of blowing sand, the stars over the Arabian desert never seemed so bright or so numerous. Those were the best nights of sleep I'd ever had. We all —children included—came back from seven nights of camping wind-blown and sand-encrusted, but thoroughly rested and refreshed.

When I awoke at daybreak the second morning out and looked around I discovered we had company. A strange red truck had pulled up to our camp sometime during the night and now the Bedouins who had arrived in it were having coffee and talk with the Arabs in our party around a freshly-made fire. The truck, hauling a large quantity of dates for the encampment of a local amir, had experienced a mechanical breakdown during the night. Would we carry the sacks to a point along our route where another truck of the amir's could collect them later? Our Kenworth could easily transport the unanticipated cargo. That noon the numerous sacks of dates were unloaded near some clumps of sedge in a location which looked no different from any other we had driven by all morning. The mound of bulging burlap bags was covered with an old tent cloth and left to be found and removed at some future time. The episode said several things to me about Bedouins. They will not hesitate to ask strangers for a favor when there is need, nor do one in return for the same reason. They can leave goods of considerable value on the ground unattended with full confidence that no one will come along and steal them. And they take for granted that knowledge and instinct born of the desert will lead the right party to the precise prearranged spot in wide-open country where a cache will be waiting to be picked up.

Sections of terrain which appear so featureless when flown over, take on a personality all their own when viewed from the ground. I am thinking particularly of the place where we spent our second night. A map shows it as being decidedly in the middle of a desert, with no special topographical mark to set it apart from any other desert location: a blank. Yet I remember it as being most distinctive. From a sandy "promontory" near our campsite I looked down on what surely must be a broad, flowing river. In actual fact it was a salt basin, set apart from banks of white sand on either side by its rippled mud-brown surface, parched and cracked in the sun.

The illusion of being on a pleasant riverbank was further heightened by some '*asal* bushes, some as tall as a man, which gave the area a bit of green and some welcome shade. Hadban had led us to the place, but he had his own opinion of its allure. Perhaps the unique, tree-like bushes and the unusual topography contributed to its reputation, but whatever the reason the location was widely believed among the desert nomads to be inhabited by jinns. I was never sure whether or not Hadban went completely along with the superstition, but with such a youthful and eager audience he was no man to pass up a good story.

By the morning of the third day out we had picked up, on schedule, another Bedouin guide. Muhammad ibn Salim ibn Bakhit was, like Hadban, of the Murrah tribe, and the two men were distant relatives. Jim Mandaville had learned from Hadban that Muhammad knew of a meteorite which no Westerner had ever seen before. Word was somehow passed over the desert "telegraph" when and where we would meet him. The perfect connection with our second guide out in the middle of nowhere vastly increased my already considerable admiration for the Bedouins' sense of direction and place. We had been driving several hours through virgin sand-and-sagebrush country when suddenly Jim's lead car pulled up to a flock of sheep being tended by a handsome nomadic herdsman who seemed not a bit surprised by our appearance. While we waited, the shepherd went to get his brother Muhammad from the family tent over the hill. Our new party member threw his blanket roll into the truck, climbed into my car, motioned for me to start; and we moved on south.

Though there was no sign, our little caravan was now entering the Empty Quarter. It was as if we had been maneuvering off an ill-defined coastline for some time, and now had headed out to sea. Even the dried-up bits of desert shrubs were being left behind, and the Arabs loaded up several nights' supply of *hatab* for burning: where we were heading, straight into sand dune country, bushes would be scarce. With two guides now leading us, either Hadban or Muhammad always rode up front with Joanne and me. They were doing the conning; I was merely the helmsman, taking orders by watching their hand signals out of the corner of my eye.

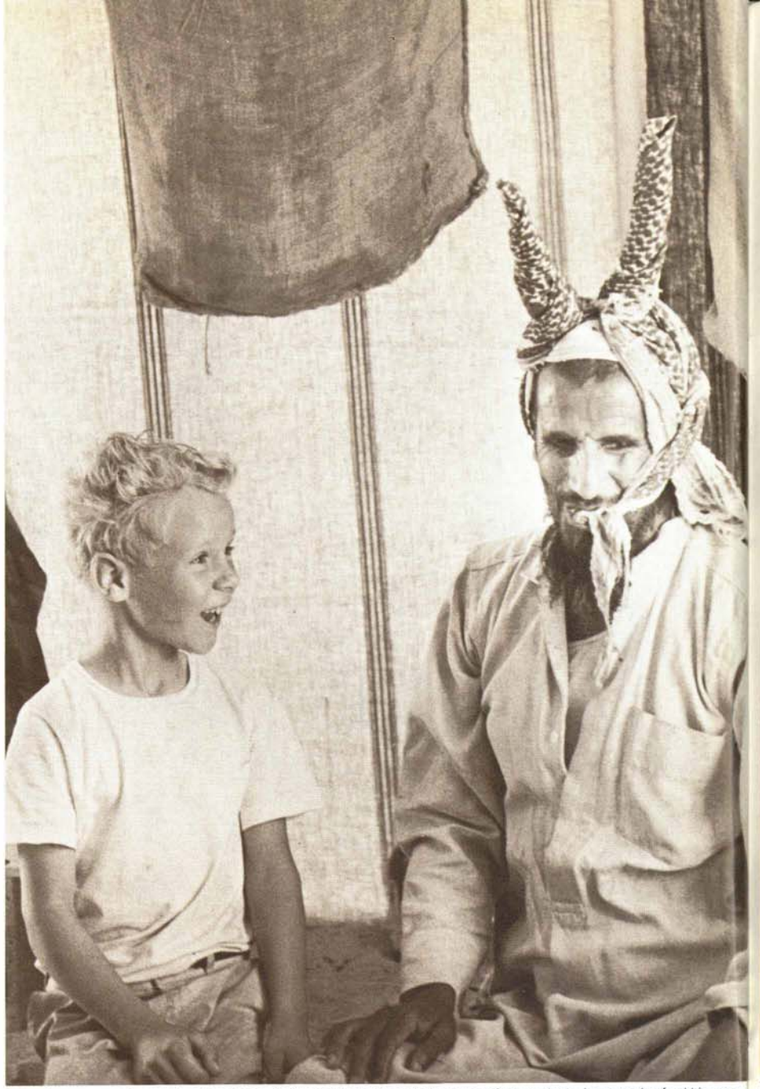
Muhammad had a particular sign when a passage was going well. He would start singing, always the same tune, alternating verses with a reprise hummed with closed lips in a soft, sweet falsetto. It was an old Bedouin song, with a sad philosophical content:

"My longing . . . is like the longing of an old lady for her dead son.
"She sheds copious tears whenever she hears his name,
"And claps her hands in agony at every singing bird."

The deeper we got into the Rub' al-Khali the greater was the need for extreme alertness on the part of both guides and drivers. Sand surfaces in that part of the world play strange tricks on the eyes, especially around the middle of the day, when there are no shadows anywhere. Most of the surfaces we traveled over now were hard and smooth, but the ever-present sand could be very soft in low and sometimes unexpected places, and the consequences of getting stuck was plain hard work for all hands. Our two cars traveled far enough apart in this country so that if one ever got into trouble the other would be warned to stay back. Then, whenever Hadban didn't like the looks of an area up ahead, alerted by sand with ominous ripples on its surface, he would leap out of the car, pull his *thaub* up over his knees and sprint like a gazelle to test the place in question with his feet. Between the two passenger vehicles, we had to be pushed out only five or six times the entire trip.

Negotiating the sand dunes themselves required precautions of another order. On the ascent we always slowed nearly to a stop as we approached the crest to see what was in store for us on the other side. It was impossible to tell whether the descent would be a gentle grade or a steep and hazardous slip face without a close look from the crown. Only once did our eyes fool us. My two front wheels were already over the crest before I realized that this was no gentle slope downward. There was no backing up. The dune face was only about eight feet high and luckily we had approached the top of it at right angles, so there had been no danger of flipping. But from here on, in any cases of doubt Hadban scouted the empty space over the far side of the hill.

With three vehicles in our caravan constantly on the ascent and descent at differing moments in this dunes country, it was amazing how quickly one could lose sight of the others. The truck was again having trouble keeping pace with the lighter cars, and when it got too far behind, the Land-Rovers would climb to the top of the nearest high dune, where Hadi and Mutlaq could see us, and wait. Often we heard the faint roar of their engine before we spotted the Kenworth itself. And usually the first portion of the truck to appear was its huge A-frame, inching its way over the top of a distant dune like a gallant ship's bowsprit.



When the campers stopped at a desert tent, Kevin watched a Bedouin jester transform a ghutra into a pair of rabbit ears.

In the area of al-Hadidah, the most distant point in our journey, we intended to look around in locations somewhat widely separated from one another, and for speedier maneuverability decided to leave the Kenworth at our campsite and use only passenger cars that day. Expecting to return to the same spot in the evening, Hadban employed an old Bedouin trick. He deposited a mound of brush on top of the highest dune around as a kind of navigational aid to guide us in.

One early evening in camp Jim Mandaville, getting ready to preserve some insects and snakes he had been collecting during the day, lined up his specimens of a folding table and asked his eldest son, "Kevin, do you know where the lizard is?" Kevin's answer could have come only from a seven-year-old boy: "I don't know, Dad. Maybe it's in the car someplace."

The desert we were traversing did not look as if it could support a living thing. Yet there is in the Empty Quarter a vast variety of creatures marvelously adapted to its extremely severe conditions. It took only Mandaville's scientific interests and the natural acquisitive instincts of Kevin, Riki and Claudia to find them.

The creatures causing the greatest excitement among the children were the skinks, a family of lizard by no means rare in desert environments. Their scaly bodies, about four inches long, are highly polished, and by means of well-developed limbs ending in five tiny digits they can literally swim just under the surface of soft sand. Hadban instinctively knew where they were traveling out of sight, and crouching low over a patch of sand would suddenly grab and bring up, with a triumphant grin, a wriggling lizard. Emulating his technique, the young people invariably ended up with only a fistful of sand. Unfortunately, they had not, like Hadban, grown up in the desert.

The author joins guides Muhammad (roasting beans) and Hadban, Hadi, the driver (in white thaub), and two members of Muhammad's family for the traditional round of tea and coffee.

As the days went by deep in the desert, we noted that the combination of wind and dry air had a singular effect on our persons, supplies and equipment. The ladies in the group had packed bread with which to make sandwiches and figured that even wrapped in plastic bags it would be good for two or three picnic lunches at the most. Our bread supply lasted a full six days; in that dry air there is no mold. The abrasive effect of the wind turned the walls of our tires, which had started out mud colored, into a polished ebony black. Though we had been without baths for nearly a week and, to save water, had given ourselves the most cursory hand and face washings, none of us really *felt* dirty. Long exposure to such conditions may not exhance feminine complexions, but the wind must have been, in effect, an efficient cleansing agent. In that air, too, metal could conceivably stand up almost indefinitely. Near al-Hadidah, Jim Mandaville saw an abandoned oil drum he remembered as being in the same spot some years before, when it was already a local landmark. The drum had not a trace of rust on it and was in perfect condition structurally, but constant exposure to the winds from all sides had polished its surface to a rich brown satin-smooth patina.

Because the truck had developed some mechanical trouble, our trip lasted three more days than was originally planned, but we were never seriously concerned over the delay. Original conservative estimates of food, water and fuel gave us one kind of peace of mind. Equally important, our contacts back in Dhahran, who would have launched air and land search parties if our return had been delayed more than 24 hours without

explanation, knew where and how we were the whole time. Mandaville was able to "talk" to Aramco Communications by key over his low-powered radio transmitter and hear spoken replies on his short-wave receiver. The first time Jim set up his transmitter unit he was concerned about having a high-enough antenna. Searching for some kind of extension, his eyes lit upon Claudia's stilts in the truck. He lashed one end to the other, secured the two poles to the truck's A-frame, and was in business. What I had harshly judged to be the most frivolous pieces of cargo we had brought along turned out to be among the most essential.

The author's wife Joanne meets a hooded falcon while (opposite) Riki Mandaville takes a good look at a skink.

We had finally evolved an organized routine, and though the long hours of driving were tiring, the days passed all too quickly. The face of the desert was constantly changing and even the weather offered sudden and unexpected surprises. In one 24-hour period in the Empty Quarter we had calm, chill, gales, heat, and a fairly heavy rainstorm accompanied by thunder. During the thunderstorm there was so much electricity in the air that the antenna lead to Jim's radio crackled with sparks and began to smoke as he was driving along.

Essential material needs were in good supply. Our families were with us, sharing our experiences, instead of being somewhere else and perhaps needlessly worrying. We were well accounted for to all others concerned. There hadn't been a strange human being in sight for days; the world outside moved farther and farther away. A kind of euphoria was setting in, the desert counterpart, I suppose, of raptures of the deep. It became conceivable that a point could be reached where I wouldn't care if we ever saw civilization again.

We pushed on in a southerly direction, for we had not yet come to the place Jim Mandaville wanted to examine in detail. This was the area called al-Hadidah (Arabic for "piece of iron"), where there still exists considerable evidence of meteorites having fallen in the indeterminate past. Several explorers of the Arabian deserts, most notably H. St. John B. Philby in his *The Empty Quarter*, have written about these sites. Muhammad had agreed to lead us to one unknown to the outside world. We had zigzagged over the sands from our base camp for about two hours when suddenly, just after rounding the base of a dune, our Bedouin guide quietly made his familiar sign to stop. The reason for our unexpected pause became apparent as we all got out of the cars and saw shapes of a dark brown-and-black substance outlined in the sand in an area no larger than a modest living room. They were fragments of oxidized iron, the largest weighing about two pounds, all strongly magnetic, with every indication that the collection had once been part of a meteorite.

Mandaville examined each of the larger pieces in detail, made some penciled jottings in his notebook, and we moved on to meteorite sites described in published works on the Rub' al-Khali. One was a crater evidently created by the impact of an extraterrestrial object of some size. As we explored the bowl, looking for more metal fragments, Hadban would call excitedly, "Jeem . . . Jeem!" to attract Mandaville's attention to some discovery he thought merited scrutiny. At another site we collected minute pieces of fused silica, glass-like, smooth and jet black, some round like pearls and others teardrop-shaped. Among the oddest manifestations of the meteorites were porous chunks of fused silica, coated, apparently as they splashed into the air from some enormous impact, by iron-rich gases. The resulting masses, with their soft-appearing insides and smooth chocolate-colored coatings, look for all the world like some unearthly kind of Eskimo pie.

I had been impressed by Muhammad's ability to guide us through this vacant country characterized by nothing but sand dunes to a spot on the desert floor no larger than 9 by 12 feet, and wondered out loud many times how the Bedouins do it.

Jim Mandaville, who knows desert nomads well, refuses to attribute their marvelous orientation abilities to any mystical sixth sense. The true desert-dwelling Bedouin, he says, simply utilizes his highly-developed powers of observation to the fullest, noting every slight change in plant life and sand-dune characteristic as he goes along. The nomad's sense of direction is just as acute. Mandaville had a compass above his windshield and when Hadban told him to head "where the sun rises," Jim pointed his car due east. Hadban corrected the car's direction by four or five degrees, explaining "I should have said, 'where the sun rises in the *winter*'."

This isn't to suggest that the nomad is infallible. On our way back to Dhahran, for example, we were to drop Muhammad off at 'home,' but when we pulled up to where he *thought* his tent would be, all we saw was a rather forlorn mound of personal belongings covered by a goat-hair cloth as protection against the elements. His family was in the process of moving to a new location which offered better grazing for livestock. A portion of the household effects had already been transplanted—but where were the people? We spent a good part of the afternoon atop the highest surrounding hills searching for Muhammad's family through a violent *shamal*.

The next evening the rest of the party drove back into Dhahran. The air was noticeably humid, the bright street lights looked so foreign now, and for the first time our home town, even though it was late at night with no people abroad, appeared strangely *crowded*.

Brainerd S. Bates, whose assignments as a writer with Aramco's Public Relations Department have given him a broad knowledge of Saudi Arabia, is an enthusiastic outdoorsman and photographer. ——