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CSF

THE SPLENDID SULTAN



mats were negotiating, his biggest coup in this respect being his long-range alliance with Charlemagne. As a result, the Umayyads of Spain never did imperil the extension of the Abbasid Caliphate west along the Mediterranean shores of North Africa. Safe from outside interference, Haroun al Rashid was free to develop his city and his empire.

The beautiful furnishings of the royal palace reflected the prosperity of Baghdad. The Caliph's merchants were known in the trade marts of the world. Their ships docked at Aden and Bombay and Cadiz. Their caravans plodded the historic trails to Medina and Samarcand. They filled the bazaars of Baghdad with the articles mentioned above, and with such other exotic goods as Indonesian dyes and English honey. No other city on the globe could compete with Baghdad in luxury.

Haroun al-Rashid ruled Baghdad through administrative districts, each under its own mayor accountable directly to him. The arts and crafts of the city lay grouped together — a builders' quarter, a tailors' quarter, a physicians' quarter, and so on. Since the people of Baghdad craved entertainment, there was even a circus quarter. And the Caliph's police were well aware of the thieves' quarter!

The police, incidentally, were strictly charged by the Caliph to supervise all shops and bazaars. They examined the goods on sale for quality and price. They tested the weights and measures for accuracy. They heard complaints from displeased buyers, and explanations both plausible and implausible from glib tradesmen. The saying went that no commercial community was more honest than that of Baghdad during the reign of Haroun al-Rashid.

The city was no less famous for its justice. The Caliph took particular care in selecting judges, interrogating each personally before awarding him a commission. And severe verdicts involving the death penalty, or long prison terms, or heavy fines, had to be approved at the royal palace.

Haroun al-Rashid's care in the selection and supervision of his officials was responsible for the romantic legend about him. He used to sally out into the streets of Baghdad by night, disguised as an ordinary citizen. He would wander through the city, stopping occasionally to inquire of those he met how they felt about their government.

Countless stories tell of this practice. On one occasion, a shopkeeper criticized the Caliph. When the Caliph-in-disguise asked why, the shopkeeper replied: "He stays in the palace too much. The people never see him."

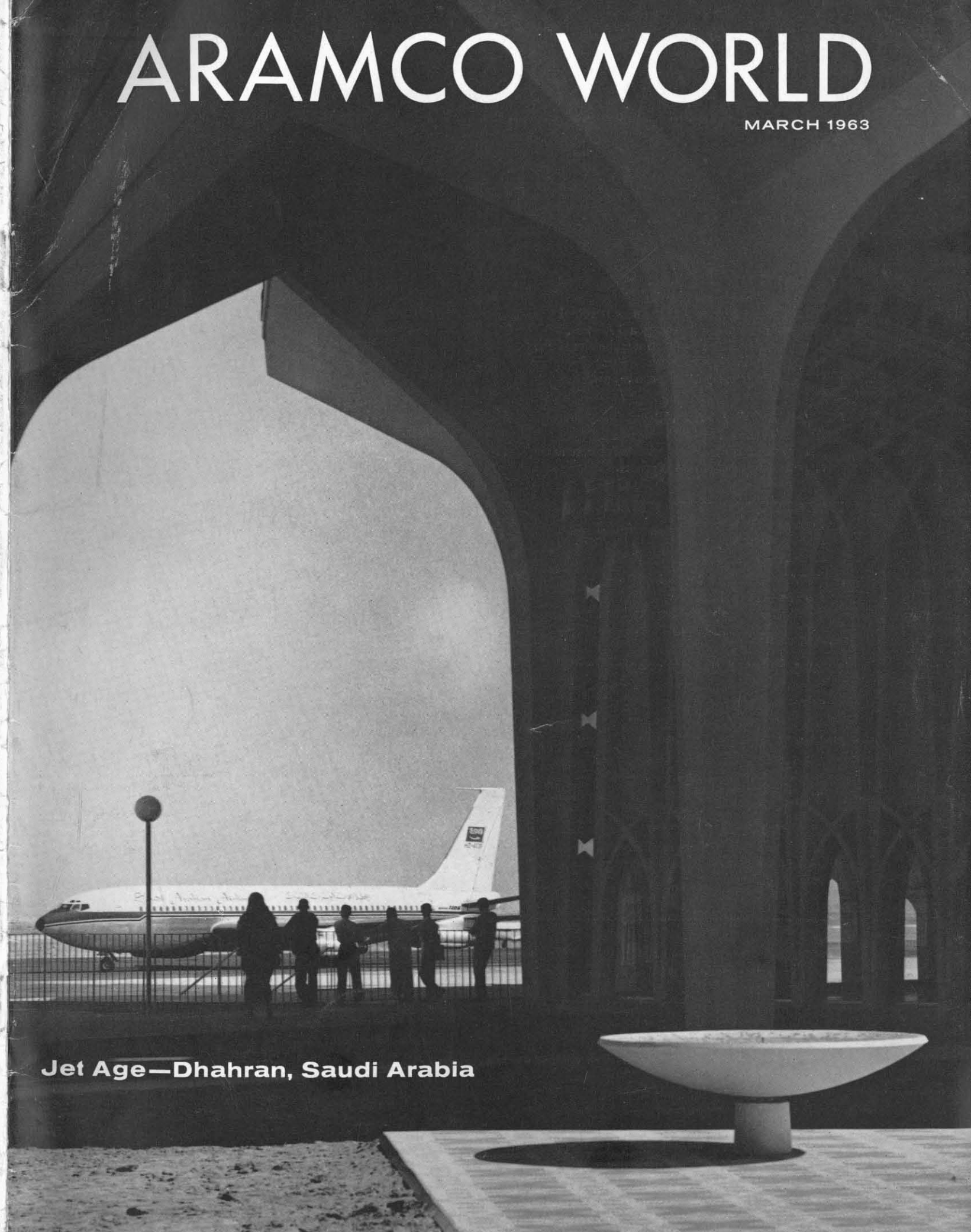
The next day a royal procession wound its way down that same street. The Caliph reined in his white steed before the shop that he had visited the night before. Beckoning the shopkeeper forward, Haroun al-Rashid asked gravely: "My friend, do you still feel that the Caliph does not mingle with his people?"

The terror-stricken subject feared that he would pay with his head for having spoken thus to his sovereign. But the Caliph smiled and threw him a bag of gold before riding on.

Out of incidents like this came the legend of the Caliph of Baghdad that still charms readers of the *Arabian Nights*. Haroun al-Rashid provides color for several of the tales by appearing as the dramatic potentate of the luxurious metropolis in which the events take place. "Now it happened in the reign of the mighty Caliph Haroun al-Rashid" — this is the kind of opening that so often captures the attention of the reader and makes it impossible for him to set the book down before he finds out *what* happened.

The reality is almost as romantic. Haroun al-Rashid frequently roamed Baghdad accompanied by the poet Abu Nuwas, who chanted extemporaneous lampoons as they pushed their way through the milling crowds at the bazaar. Back at the palace, the Caliph listened to more dignified poetry such as the devotional verse of Abu Atahiya.

Haroun al-Rashid patronized writers, artists, musicians, scholars. Among the latter, interestingly, was the feminine savant Shuhda, proving that the anti-feminist tradition was not as strong in Baghdad as has sometimes been supposed. Because of his fondness for listening to popular storytellers, Haroun al-Rashid gave impetus to the subsequent gathering of the tales that became the *Arabian Nights*, and he himself stands at the origin of much history and romantic legend. Even his death was memorable, for he fell in battle in far-off Khorasan, leading his soldiers in the defense of his Caliphate. He lives on in the historical archives, and in the *Arabian Nights*. Neither would be what they are without Medieval Baghdad and Haroun al-Rashid. ■



Jet Age—Dhahran, Saudi Arabia

ARAMCO WORLD

MARCH 1963 • VOL. 14 • NO. 3

FRONT COVER

A sleek airliner framed by the Moorish-style archways of the new terminal building at Dhahran International Airport, Dhahran, Saudi Arabia illustrates the aim of the architect to "... interpret the richness of the past through logical modern means."

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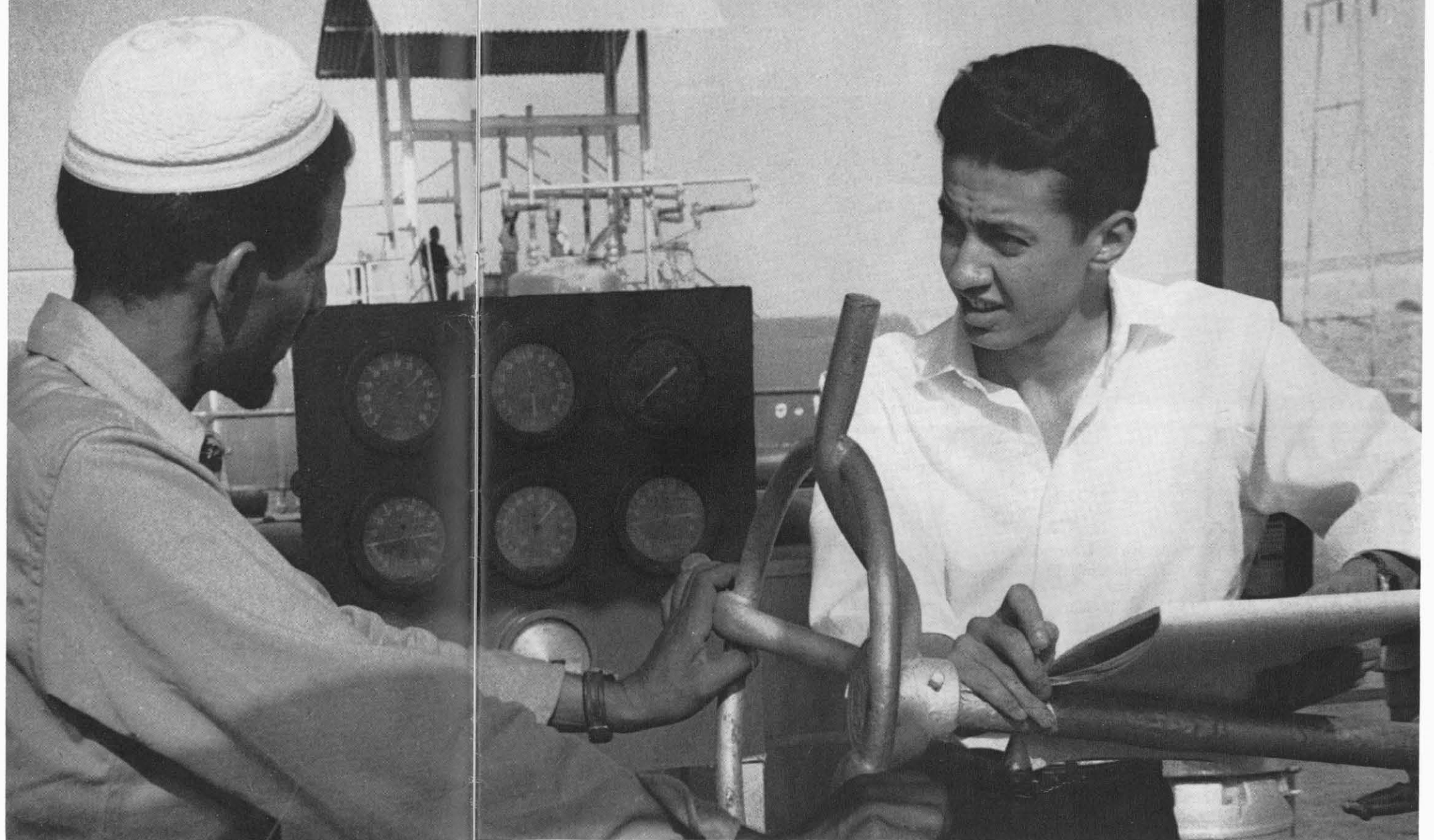
Jetliners from all points of the compass touch down in Saudi Arabia at an airfield with the finest in facilities.

THE SPLENDID SULTAN22

Once upon a time, there reigned in the old city of Baghdad a sovereign known as Haroun al-Rashid.

PICTURE CREDITS: Front cover, Aramco photo by Abd al-Latif Yousef. Pages 2-3, 4, 17 (center), 18, 19 (top), 20 & 21 (bottom) & 21 (left) - Aramco photos by V. K. Antony. Page 5 (top) - Aramco photo by Hamad. Pages 5 (bottom) & 6 (bottom) - Aramco photos by Ali Khalifa. Page 6 (top) - Aramco photo by Mentakh. Pages 7, 8 & 9 - New York Public Library. Pages 10 & 11 - Jordan Tourism Information Service. Pages 12 & 13 - Dr. Philip C. Hammond. Pages 16 & 22 - The Bettmann Archive, Inc. Pages 17, 20 (top) & 21 (top) - Aramco photos by Abd al-Latif Yousef. Page 19 - Aramco photo by E. E. Seal.

A publication of the Arabian American Oil Company - A Corporation
505 Park Avenue, New York 22, New York
T. C. Barger, President; J. J. Johnston, Secretary; E. G. Voss, Treasurer
Issued by the Public Relations Department, T. O. Phillips, Manager



Farouk Abdul Rahman Murad (right) interviews an Aramco employee as part of his summer work with Aramco's Industrial Relations Dept.

SCHOLARS ON THE JOB

For many Saudi Arab
college students,
the good old summertime
means working
for Aramco

NEAR THE END of August a year ago, a young college student who had completed four years of electrical engineering studies at Gauss University in Berlin sat down and took a hard and mature look at what he had accomplished on a summer job in his chosen field.

He had been working for the Mechanical Services and Utilities Department of the Arabian American Oil Company in Dhahran, Saudi Arabia since the end of his spring term. Almost three months had passed since Aramco had flown him from school in Germany to its company head-

quarters at Dhahran, Saudi Arabia on the Persian Gulf.

"My summer employment," he wrote, "helped in giving me an idea about the American equipment used in the Aramco telephone and wireless systems. I thereby gained valuable empirical experience.

"I also profited greatly," he continued, "from observing the operations, the manner in which work and maintenance duties were allocated, the relationship between the supervisor and the employees during work, the mutual understanding between them with regard to orderly operations,



Summer-worker Hussein Mohammed Ali Alawi (right), a student from King Sa'ud University, Riyadh, discusses accounting with Aramco's Andrew Brown.

SCHOLARS ON THE JOB

and the way in which they face and solve problems together with ease as a result of the understanding prevailing amongst the employees."

The student, 'Abd al-'Aziz 'Abd al-Malik Sabri, was one of 38 Saudi Arab college students who had been working in Aramco's eight-year-old summer employment program.

From the time it began its search for oil in the eastern deserts of Saudi Arabia in 1933, Aramco has undertaken an interesting, and sometimes notable, succession of innovations. These have ranged from ingenious make-do tools, used in quelling a destructive oil well fire, to complex technical assistance programs. The company's summer employment of Saudi Arab students has been one of the most interesting and difficult of Aramco's unusual ventures.

Willing to learn from experience, the company has asked for and received the uninhibited criticism of the students themselves who have thus helped shape the program.

An American reader recalling his or her own summer jobs while in college might be slightly surprised at some features of Aramco's summer employment program. Free air transportation from school to the job? An assignment in one's field of study? Being asked to criticize one's employer?

Before taking a close look at Aramco's novel program, it would be well to examine the American phrase "summer job." It's a nostalgic phrase for many, one that gives rise to a wide range of private images, which, taken together, can provide an insight into changing American attitudes.

For instance, in the 1920's many college students looked upon summer jobs as paid vacations. They worked on cruise ships or at seashore resorts. The great depression changed all that. In the 1930's, summer work became mandatory for many — and any job would do. But by the end of that grim decade students and faculties alike began to look upon summer jobs as training grounds for careers.

The trend toward "valuable empirical experience," as

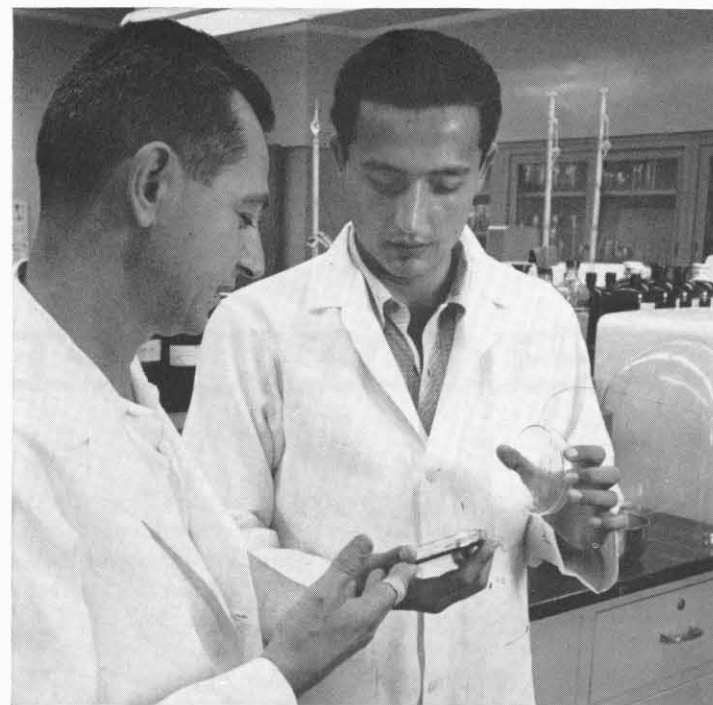
'Abd al-'Aziz Sabri aptly calls it in his report already quoted, has grown during the past two decades in the United States.

The Saudi Arab college students view summer work with Aramco strictly, and solely, as a way to get actual job experience in one's specialty. They have no concept of the "good-time" summer job.

As a result, the Aramco program, begun in 1955, required year-by-year custom building, so to speak. Each job must square with the idealization of summer work held by the selected students. There are many practical problems that grow out of such an approach. Every job must be previewed and carefully screened. New jobs are *not* created for the summer program. Long before the students arrive at the Aramco headquarters in Dhahran, Saudi Arabia each June, an elaborate system has been set in motion that critically analyzes the available jobs and the academic interests of the students eligible for the program. This is the heart of the program: matching job and student. It is a difficult undertaking that Aramco can now approach with considerable experience. Underlying the long-range success of the program is the Aramco policy that every job must be *bona fide*.

By the end of last summer, 321 college students had worked for the company during their summer vacations. Ten had worked in New York City, one in London, and the rest in the three major oil centers of Saudi Arabia: Dhahran, Ras Tanura and Abqaiq. The first year there were 21 Saudi Arab students in the program; 49 were "enrolled" in the 1962 summer program.

During the first three years of the program the students came from the University of Cairo, Ain Shams University



Pre-med student Adnan Mohammed al-Habbal (right) and Dr. I. S. Alio, Aramco Medical Department, check some malaria cultures.



Saudi Arab students, summer employees of Aramco, and their American counterparts, sons of Aramco employees, hold get-acquainted dinner.

(also in Cairo) and the University of Alexandria. In 1958, Saudi students were also selected from the American University of Beirut and the American University of Cairo. The following year the first Saudi Arabs attending colleges in the U. S. and Canada were added to the program.

More recently, summer college employees have come from a growing list of schools including the Universities of London, Manchester, Vienna, Kiel, Edinburgh, Pennsylvania, California, San Francisco, Texas and Kansas, as well

as Oxford University, Kansas State University, Aleppo College, Damascus University and the King Sa'ud University in Riyadh, the national capital of Saudi Arabia.

The major fields of study represented by the students have become increasingly varied. As might be expected (and as a reflection of Saudi Arabia's needs), medicine and engineering head the list. Civil, electrical, petroleum, mechanical and chemical engineering students have worked in the Aramco program. Other academic fields represented by the Saudi students have been: economics, public administration, city and regional planning, law, philosophy, political science, agriculture, geology, business administration, geography, sociology and English literature.

The students have worked in practically every department of the company. They have held assignments in the medical, engineering, refining, producing, exploration, accounting, public relations, industrial relations and government relations groups.

A glance at this partial list of departments reveals that several hundred college students within one generation will have entered the business and professional life of their country with some concrete knowledge of Saudi Arabia's number one industry — petroleum. Besides getting some first-hand knowledge about their own specialties, the more perceptive students will have learned that the oil industry is enormously complex and requires an extraordinary range of services, operations and skills.

However, this broader view is more likely to come to a later generation of students. Right now the young men who leave the Kingdom to study — usually on scholarships provided by the Ministry of Education — tend to focus their interest strictly on the job in hand and they want that job to be limited to their college major.

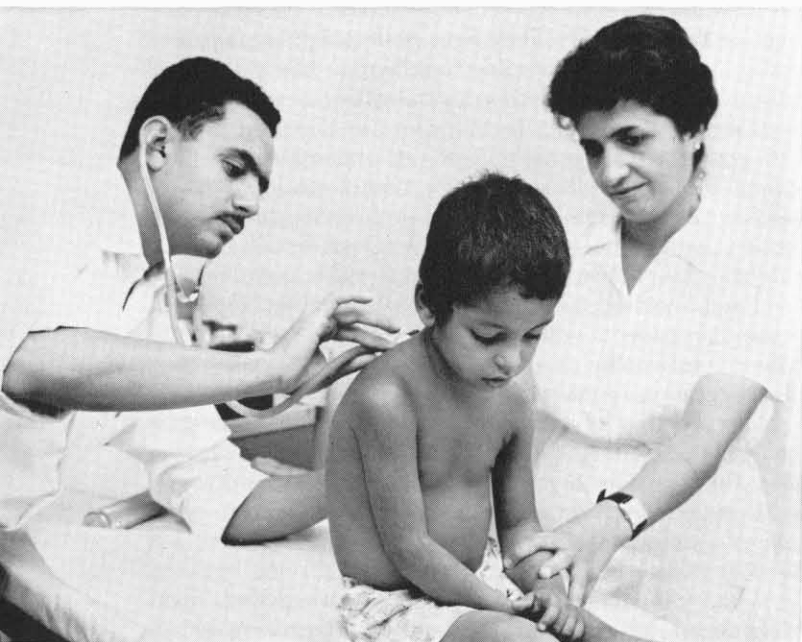
At the close of the 1961 summer work period, Ilyas Mohammad Mansur-Bima, a political science major at Aleppo College in Syria, reflected this point of view when he told the company that he felt the work he had done



Aerial photo helps 'Abd al-Aziz Eid Tamimi, a commerce major, compile data on industry for Aramco's Arab Development Dept.



Mousa Nimr al-Sohsa, a senior at Kiel University, West Germany, put his geology training to work last summer with Aramco's Exploration Laboratory.



A youngster gets a check-up from Zohair Ahmed Sebai, a recent medical school graduate. Nurse Mariana Risk of the Aramco Medical Dept assists.

SCHOLARS ON THE JOB

had not exactly fitted his major. He wrote in the report each student is asked to prepare that the company could improve the program by employing "every student in accordance with his specialization."

Thorough planning has minimized this type of complaint. The plan now used is based upon a series of steps. Early in the year those in charge of the program survey the company departments. Will the departments have a place for Saudi Arab students this summer? How many? For what jobs?

The requisitions are examined by employment supervisors to determine job suitability. The same team will later interview the student applicants. Each job goes under the microscope. What specific knowledge or experience does it require? What level of English comprehension will be needed? Will the supervisor be available for guidance and advice? Is the work schedule irregular? Does it involve outside work? Or field trips? Will the student have to be able to drive a car?

In March a letter in Arabic goes to each Saudi Arab college student on a list provided by the Ministry of Education. Students who have completed three years of college work are eligible to apply for interviews. An interviewing team tours the campuses of the Middle East and Europe. Other interviewers see the students in the U. S.

Following the interviews, Aramco undertakes the job of matching students and jobs. The successful applicants are then notified.

One important step remains. The students are flown to Dhahran. There in a series of conferences they learn about Aramco, their work, their air-conditioned living quarters, their recreation facilities and their responsibilities. They are also given an advance on their summer salary. (The more careful among them return to college in the fall with as much as fifty per cent of their earnings.)

At summer's end each student is asked his opinion of the program and his own assignment. He is also asked to offer suggestions for improving the program.

How successful has the Aramco program been?

The men responsible for it have had no precedent to lean upon. They have had to proceed by trial and error. They are, therefore, not inclined to puff up the gains that have been made. However, they are pleased to exhibit student comments that show — aside from the many expressions of gratitude — that the program has been a real help to many of the college boys.

Two summers ago, 'Abd al-'Aziz Abbas Rafie, an economics major at the University of Cairo, wrote in his terminal report:

"My summer employment has helped me a lot in preparing for my future career, which is business administration. . . . It has also taught me that my future career is a very great responsibility on my shoulders. It makes me think more seriously about it." ■



The Crocodile's Tale

Wherein the members of this fearsome family are shown to be interesting—from a distance

THE LARGEST, OLDEST and, some contend, most ferocious reptiles on earth are the Crocodilia — a durable family of creatures whose genealogy makes Man seem like a newcomer to this planet by comparison. Their fossils date back 190 million years to the Triassic period, when they would have been contemporaries (if not playmates) of the dinosaurs, yet they still thrive today in the warmer parts of the world from the banks of Middle Eastern rivers to the swamps of Georgia and Florida. Although they have been objects of fear throughout history, some peoples, particularly in the Middle East, have also venerated them and preserved them as mummies.

Scientists are not certain there is any direct genetic relation between Crocodilia and Dinosauria. The direct ancestors of the Crocodilia are still unknown and authorities have differing opinions about their proper classification, but for scientific convenience Crocodilia have been classified by R. L. Ditmars in his *Reptiles of the World* into four genres: crocodiles, alligators, caimans and gavials, of which there are 21 different known species still found in the world today.

Though the different species of Crocodilia have numerous minor differences in anatomy and habits, they are most easily distinguished by their shape, especially the shape of the snout. The most obvious difference between a crocodile and an alligator, for example, is that the alligator's snout is broad and rounded, while the crocodile has a more triangular head with a narrower, tapering snout.

Another difference is that the crocodile's fourth tooth on each side protrudes outward, but the alligator's (and the caiman's) fourth tooth fits into a socket in the upper jaw and is hidden from the outside. This extra-long tooth is for seizing the prey; the other teeth are for subsequent crunching and tearing.

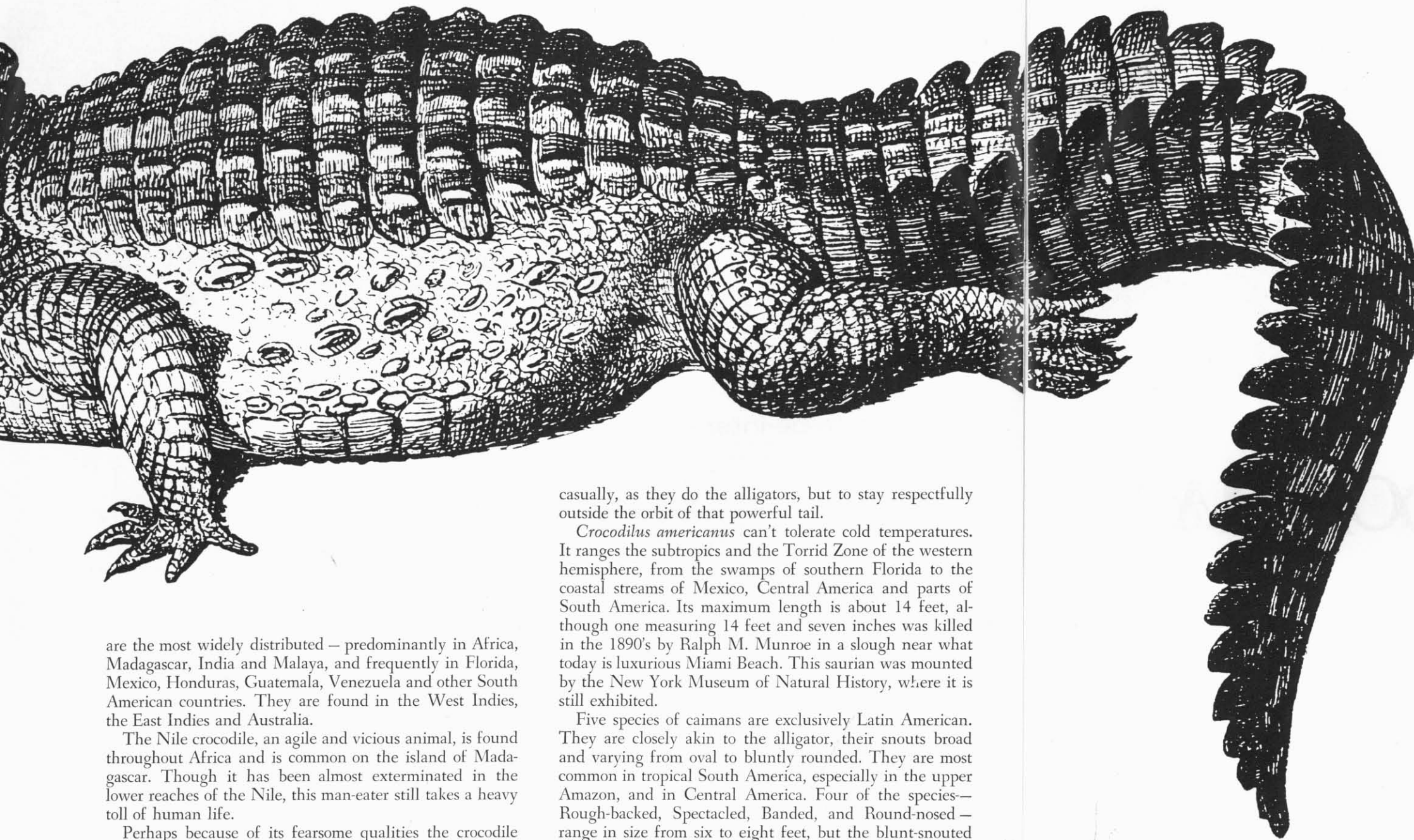
This saurian eating technique once saved the arm of Ross Allen, Florida's well-known "bring 'em back alive" hunter. One day an alligator clamped its powerful jaws on Allen's left forearm, but the 'gator had miscalculated and missed spearing him with the seizing fangs. Allen, who knows the ways of alligators, did not panic and try to pull his arm free. He simply waited, knowing the reptile would try for another bite. When the jaws opened for a more satisfactory grab, Allen promptly withdrew his arm, with only superficial punctures and abrasions.

"El lagarto" is the Spanish term for lizard, of which "alligator" is the obvious corruption, although in Latin America "lagarto" refers to crocodiles and caimans. True alligators are found only in the southern United States (*Alligator mississippiensis*) and a smaller version in southern China (*Alligator sinensis*). The American alligator has been known to reach a length of 16 feet, but its Chinese cousin never grows longer than about six feet.

In parts of India, Sumatra and Borneo are found the gavials, which are most distinctive in shape. Their snouts are long and extremely narrow — "extending from the head like the handle of frying pan," wrote Ditmars. In the Ganges and other rivers of northern India, the gaviel grows as long as 30 feet. The Malayan species is about half this incredible size.

Despite its formidable array of sharp, slender teeth, the gaviel is a timid creature. It eats mainly fish, which it captures by sideways sweeps of its long snout. Its name is a corruption of the Indian name "gharial," which means fish-eater. Like other Crocodilia it is a carnivore, but whenever it senses the presence of a human the gaviel shies into the water and hides.

There are 12 known species of crocodiles, five of caimans, and two each of gavials and alligators. The crocodiles



are the most widely distributed — predominantly in Africa, Madagascar, India and Malaya, and frequently in Florida, Mexico, Honduras, Guatemala, Venezuela and other South American countries. They are found in the West Indies, the East Indies and Australia.

The Nile crocodile, an agile and vicious animal, is found throughout Africa and is common on the island of Madagascar. Though it has been almost exterminated in the lower reaches of the Nile, this man-eater still takes a heavy toll of human life.

Perhaps because of its fearsome qualities the crocodile was sacred to the ancient Egyptians, who preserved some as mummies. Sebek was the name of their crocodile god. Zoologist Albert M. Reese points out that the Nile crocodile (*Crocodilus niloticus*) is probably the "leviathan" mentioned in the Book of Job.

Another man-eater is the salt-water crocodile (*C. porosus*), which has the honor of being the largest living reptile. One is recorded to have reached 33 feet from savage snout to the tip of its powerful tail. This species lives in the tidal waters of India and Malaysia, and has even been seen swimming in the open sea beyond sight of land.

The American crocodile (*C. americanus*) is found only in the marshes and coastal waters of southern Florida below Palm Beach. In captivity it is pugnacious and dangerous, yet in the wilds it will discreetly retire when a man approaches. Zoo attendants have learned not to treat it

casually, as they do the alligators, but to stay respectfully outside the orbit of that powerful tail.

Crocodilus americanus can't tolerate cold temperatures. It ranges the subtropics and the Torrid Zone of the western hemisphere, from the swamps of southern Florida to the coastal streams of Mexico, Central America and parts of South America. Its maximum length is about 14 feet, although one measuring 14 feet and seven inches was killed in the 1890's by Ralph M. Munroe in a slough near what today is luxurious Miami Beach. This saurian was mounted by the New York Museum of Natural History, where it is still exhibited.

Five species of caimans are exclusively Latin American. They are closely akin to the alligator, their snouts broad and varying from oval to bluntly rounded. They are most common in tropical South America, especially in the upper Amazon, and in Central America. Four of the species—Rough-backed, Spectacled, Banded, and Round-nosed—range in size from six to eight feet, but the blunt-snouted Black Caiman found in some of South America's tropical streams reaches a length of 20 feet.

In Venezuela's *llanos*—flat prairie lands laced by streams and strips of jungle—the trails of caimans and crocodiles can be followed from the streams through the tall grass to the pastures where wild horses and wild cattle graze. Natives avow that a big caiman can break the leg of a cow or horse with its tail. Once the unwary animal is brought to earth, the reptile then drags it to the stream to first drown it and then devour it.

Compared to his wild, aggressive cousins, the American alligator is a gentleman towards people, even though it can roar and hiss—and look—like a dragon. In captivity the alligator, unlike the peevish crocodile, seems to ignore humans or even regard them with amused tolerance. A relaxed alligator, seen in profile, appears to be grinning.

At Florida alligator "farms," where its tough appearance makes tourists shudder, it even submits to wrestling. A strong young man will tussle one out of a pond and onto a float by first throwing it on its back and then gently massaging its solar plexus until the 'gator is "hypnotised" and goes limp. No crocodile would stand for such treatment.

In the United States where the alligator was once at home in streams, swamps and bayous from North Carolina to the Mexican border, his chief refuges today are the Florida Everglades northward to the Okefenokee Swamp in Georgia. To prevent extinction of the species, the State of Florida now imposes heavy penalties for killing them.

The alligator hibernates during the winter by tunneling into a muddy bank beneath the surface of the water. But while the entrance is under water, the burrow slopes up-

wards into the shore 20 or more feet until it is above the water level.

After three to five months of hibernation the 'gator emerges and sets out to break his fast. His springtime hunger makes almost anything look tasty—fish, water birds, mammals, crustaceans, other reptiles, even smaller alligators. Perhaps to aid in assimilating this diet, he usually consumes a few good-sized rocks and pine cones—a family trait among all Crocodilia.

Mating occurs in the spring and the roars of the bulls can be heard for miles. The males are noisy and quarrelsome. Their thumping, moaning roars may be challenges to rivals, but the noise also serves to attract females.

Early in June the female alligator builds her nest, usually on shore near a tree or bush. She makes a pile of grass, reeds and leaves which she compacts solidly by crawling over it. The male is no help; after the mating he loses all interest in the matter and goes on his way.

After hollowing out the nest, the female lays her 30 to 40 eggs and covers them with more vegetation, which she packs as before. Sun and moisture cause the vegetable material in the nest to ferment, which makes the nest a warm incubator with a temperature of about 80 degrees F.

For about two months the female alligator stands watch near the nest until the unhatched youngsters reveal that they are ready for the world by squeaking shrilly inside their shells. They can be heard a yard or more away. The female then uncovers the eggs, for while the youngsters can break their tough shells, they lack the strength to burrow through the compacted nest.

Opening the nest apparently completes the cycle of motherhood. The female may remain around to protect her offspring for a short time, but they are soon on their own. They satisfy their appetites with insects and worms on land, and water bugs, pollywogs and the miniscule forms of plankton in the water. Later they learn how to sweep small fishes into their elongated mouths. They need no swimming lessons; tail-swishing and paddling their feet come naturally.

During the Civil War, the demand for shoe leather in the South gave rise to 'gator hunters and tanners, but business fell off at the close of the war. Alligator hide, even with advanced processing techniques, proved inferior to cowhide for shoes.

Around 1900, however, manufacturers created a new demand by making belts, travel bags, portfolios, cardcases and women's handbags of crocodilian leather, and consequently the alligator was practically eliminated from the southern United States. Today most of this leather comes from Mexico, Central America and the Caribbean Islands.

But the alligator is much more interesting in person than as a handbag. He's the showman of the crocodilian world, and several of these saurian ham actors loaf around the spots in the Everglades National Park where the rangers give brief nature talks to visitors.

Old George, a 14-footer who lives in the Royal Palm Station pond, is said to roar splendidly each time he is introduced to a crowd of tourists. ■



Built on a formidable bluff during Crusader days, this castle stood guard over the ancient caravan routes between Jordan and Arabia.

JORDAN'S DESERT CASTLES

*Early caliphs found
a way to combine
the comforts of city living
with the peaceful
solitude of the desert*

AS RULERS, EARLY CALIPHS knew and appreciated the luxuries of city living. As men of Arabia they also felt the impelling call of their ancestral home in the desert. To fulfill both desires they built elaborate retreats in the "black desert" of what today is Jordan, where the shifting sands and wailing winds reminded them of the stirring days of their fathers before them. There, in somber solitude, game was pursued on spirited horses, falcons blinked unhooded eyes from soaring heights, comradeship was welded in vigorous sport, and men could drink sweet coffee in shaded quiet and talk of the past and future glories of Islam.

These retreats were the desert castles of the caliphs of the Ommaid dynasty, during the period 661 to 750 A.D. Small in size, representing fortresses, pleasure palaces, watch-posts and hunting lodges, the ruins of more than a dozen of these

qasrs furnish both archaeologists and tourists with a glimpse of the ancient wonders of the Middle East.

Familiar to all who have ever traveled from north to south along the shining tracks of the historic Hejaz Railroad, the "black desert" is a wasteland of sand and black pebbles stretching as far as the eye can see, broken here and there by small hills and dry stream beds. Lying roughly between Amman and Madeba and once secluded, the desert today is easily penetrated by truck or car. The route, more or less defined in the shifting sands of the open country, is a boulevard into the fabled days of the first caliphates.

Once across the narrow-gauge rails of the Hejaz line, modern civilization slips away and the museum of time begins to present its wares. The route leads eastward and the denizens of the desert begin to appear—the mammoth lizard and his smaller relations dart this way and that; an



JORDAN'S DESERT CASTLES

occasional *wawi* scuttles, bushy tail between his legs, away from the scent of man and automobile; desert birds flutter in the air at the unfamiliar sound of a motor; the ever-wheeling eagle presents white body and coal-black wing tips against the deep blue sky. The distant horizon, broken by scalloped hills, shimmers in the waves of heat rising from the desert. Now and then camels lumber into view—a last futile stand of Time against the diesel truck now dustily careening along the desert routes. Nearer the scattered villages of this isolated region sheep and goats search out the last vestiges of winter's greenness under the watchful eyes of little boys, shy girls or aged uncles. All this is the lure of the open land which tenaciously held its place in the racial memory of Islam's first rulers.

There are many ruins between Amman and Madeba, some well-preserved, others collapsed into rubble. The first of these is Qasr el-Mushatta, a square structure almost five hundred feet on a side with 23 towers guarding its faces. Walid II was probably the builder of this enterprising structure, in the first half of the eighth century A.D., but for some reason his desert palace was never completed. In time, weather, earthquake and human acquisitiveness took their toll, and today only a trace remains of the promised grandeur of its carved blocks. Now, the vaulted rooms within the original square enclosure loom high above the surrounding debris. Lavishly decorated pillars stand at the entrance to the central trefoil hall, once domed with fire-burned brick. The vaults of the long side rooms are better preserved than the central section, but lack their front and rear walls and resemble Quonset huts in the desert. Given to Kaiser Wilhelm by the Turkish sultan Abd el-Hamyd just before the First World War, Qasr el-Mushatta was

Qasr el-Azraq once guarded Wadi Sirhan, the ancient trade route running north and south across Jordan's "black desert."



almost completely stripped of its carvings, which were carted away to Berlin where most were destroyed in the ravages of World War II.

From Qasr el-Mushatta the track leads northeast to an ancient Roman reservoir half the size of a football field. Yazid II had a palace here, but its traces are almost gone. This is el-Muwaqqar, once a caliph's triumph, now the site of only a small village and a Desert Patrol post. One of the cisterns at this *qasr* yielded an hydrometer whose Kufic signs show a level mark of over thirty feet, indicating a fantastic supply of the water so precious in the arid desert.

Qasr Kharana, which lies southeast along the track from el-Muwaqqar, is perhaps one of the most interesting of all of the desert castles because of its foreboding fortress-like appearance. This great rectangular structure seems to leap out of the black-pebbled desert floor as a symbol of the power of the caliphs of old. One of the earliest of the Islamic-built castles (a painted inscription dates it to 711 A.D.), this building looks the most rugged of all, with arrow slits and tiny windows adding to the invulnerable look of its round-towered walls. Its strategic position, on a great scarp where ancient caravan routes crossed, also suggests a fortress in the truest sense. Built of large blocks of undressed stone, with rows of smaller stones laid between the courses, the face of the structure was completely plastered over to emphasize its appearance of solidarity. Plaster was liberally used, architecturally and for decoration, inside as well.

Stepping through the high-linted southern portal, one enters a typical fortress-lodge of the early period. Long rooms on each side of the entry passage housed the stables. In the rather plain lower story, other long rooms extend along the other three sides, with smaller ones sandwiched in among them. In the center is an open court where the remains may still be seen of the columns of the balcony which went around its sides on the second story. Stairways lead to the upper rooms where the floor plan includes smaller rooms taking the place of the stables below. On this floor an almost baroque ornateness is seen everywhere—carved plaster medallions, richly decorated architectural features, stone-framed designs, as well as the inherent decorativeness of the vaultings, domes and intricately carved columns. This urge to decorate is evident even in the rows of tilted bricks used to form zig-zag patterns across the face of the outer walls. The ornateness of this decoration and some of the unique building methods employed have led experts to see the influence of Mesopotamian art in el-Kharana.

Qasr Kharana has also become the subject of much folklore, both local and foreign. Tales of disappearing stairways, still-warm cooking fires, suddenly appearing domestic animals—and no inhabitants—have shrouded the place with an air of mystery. Neither springs nor cisterns seem to exist in the neighborhood, further enhancing the *qasr's* spectral atmosphere and further beclouding its shadowy past.

At Qasr el-Azraq, some twenty-five miles farther to the east, a thriving modern village shares its palm trees, lush green vegetation, and marshy plains with ancient ruins. White salt hills dot the landscape, sharply contrasting with the long black basalt fences of the tilled fields. The site is a



Qasr Kharana is an imposing fortress from outside, but its luxurious and richly decorated interior made it a comfortable retreat as well.

strategic one, for it guards the northern end of Wadi Sirhan, the ancient trade highway running north and south along this side of the desert. Many routes still converge here today. Here, too, was the headquarters of Lawrence of Arabia at the time he unleashed the final effort of the united Bedouin tribes to drive the Turkish invaders from the area during the First World War.

The ancient castle at el-Azraq is an imposing one, as befits its location. Tremendous slabs of rough-hewn black basalt were piled high to form an enclosure almost 275 feet square. The front gate was made of a single huge block of the same stone. Inscriptions date the present building to around 1236-37 A.D., the time of Aziz el-Din Aibak, but a dedicatory inscription to Diocletian and Maximian indicates an earlier Roman structure, and still another inscription records the activities of the Emperor Jovian (about 363 A.D.). Since the Nabataeans of Petra also used Wadi Sirhan as their main thoroughfare, even earlier fortifications may have existed in the area.

From el-Azraq the track leads back across the desert toward Jordan's cities, and more tumbled ruins.

Due west, around Jebel el-Uwenid, and then south-westerly, lies Qasr 'Amra—one of the smaller hunting lodges, but one of the most luxurious of all. Complete with bath, this small *qasr* has three long parallel vaulted halls, each with a windowless resting room at its end. A great cistern and well supplied a generous quantity of water. Built during the reign of Walid I, early in the eighth century, this well-preserved complex contains some of the finest examples of early painted frescoes known.

On the western wall of the middle room, the Caliph still sits, in company with Chosroes of Persia, the Byzantine emperor, the Negus of Abyssinia, and the Visigoth Roderick. On other walls throughout the complex of rooms, philosophy, history and poetry are personified, along with

Nike, Eros, musicians, merry-makers, birds and one of the earliest zodiacal representations known. Scenes from daily life—the potter, the carpenter, farmers, servant girls—also grace the walls. The bath is a separate complex at one end of the building, with the classical divisions of *frigidarium*, *calidarium* and a furnace room. In the midst of the empty desert, such elaborateness marks this as a hunting lodge worthy of the best sports club today.

More austere is the fortress-castle some distance to the northwest of 'Amra, beyond the haphazard intersection of half a dozen desert routes at the edge of the mudflats of Qa Khanna. This is Qasr Hallabat, converted into a defense and pleasure castle by the Ommaids from the earlier building activities of Nabataeans, Romans and Byzantines before them. Only some scattered carvings remain of the Nabataean period, but the present structure was raised around the turn of the second century, as attested by an inscription from that time. Probably built as a defense against desert raiders, the original fortress was later enlarged by the Romans. In turn, the *dux* of Emperor Justinian, one Flavius Anastasius, again rebuilt the citadel in the sixth century, probably for the same purpose. Later on the site housed a monastery, and then finally became an Islamic citadel. Wells and cisterns supplied water, for the desert here is arid wasteland most of the year. Great heaps of fallen stone mask most of the decorative remains, but here and there bits of carved stone may be seen, mainly reflecting the influence of the Nabataeans, whose commercial kingdom flourished in the area and whose art remained long after that kingdom had fallen to Rome. This vital art was revived in Islamic times to delight the eyes of the rulers of Arabia Deserta.

From Qasr Hallabat the desert route returns westward to one of Jordan's modern highways, where sand gives way to macadam and civilization intrudes once more—leaving the ancient castles to the shifting desert sands. ■



THE CURIOUS WAYS OF WATER

Water seemed a simple enough substance—until an English chemist exploded some hydrogen in a bottle

THE ANCIENT EGYPTIANS attempted to purify and sweeten muddy river water by adding crushed almonds. Sanskrit writing on a 3,900-year-old tablet from India informs that water “may be given a wondrous and different new taste by dipping seven times into it a piece of hot copper.” Today many cities treat water with chlorine to kill bacteria, and some add fluoride to reduce tooth decay. Because water is probably the most important single chemical in the world, people have always sought new ways to use it and improve it — and to understand just what it is.

One of the earliest attempts to explain the nature of water was made by the Greek philosopher Aristotle in 335 B.C. when he issued his Theory of Matter. According to Aris-

totle’s theory, every substance was a combination of four basic elements—fire, earth, air and water. This idea was to keep alchemists busy for centuries trying to change common metals into gold by rearranging their “elements.” They were not very successful, however, since no one was ever able to break down a substance and find out just how much fire, earth, air and water was in it. Not until the eighteenth century did scientists decide that air, earth and fire were not really elements at all, and in 1781 a British chemist proved that water wasn’t an element either.

That year Joseph Priestley exploded a mixture of air and hydrogen in a bottle as “a mere random experiment to entertain a few philosophical friends,” and noted with interest

that the explosion caused moisture to condense inside the bottle. He repeated the experiment until he was certain that the moisture was produced from the reaction of air and hydrogen, thereby proving that water, rather than being a basic element, was itself composed of other chemicals.

In 1783 the French chemist Antoine Lavoisier elaborated on Priestley’s experiment and discovered that the hydrogen was not combining with *air* to form water, but only with the oxygen in air. Further experiments determined that a molecule of water contained two atoms of hydrogen and one atom of oxygen, a chemical combination which has been given the symbol H₂O.

The discovery that water was H₂O or “hydrogen oxide”

raised more questions than it answered, for chemists learned that despite its apparent simplicity water is actually a most puzzling and paradoxical substance which seems to defy the rules of chemistry.

Compared to other liquids, water requires a great deal of heat to raise its temperature even a few degrees, and once it is warm it loses its heat slowly. This ability to “store” heat enables water to modify the world’s climate. Oceans don’t warm up as fast as the coastlines they touch, nor do they cool off as fast, with the result that coastal areas usually have milder winters and cooler summers than areas inland. For example, Bismarck, North Dakota has average temperatures of 8 degrees in January and 70 degrees in July, while Seattle, at the same latitude, has averages of 41 degrees and 66 degrees for the same two months.

Water is the only substance found abundantly in all three natural forms — liquid, solid and gas. But in changing from one form to another some more peculiarities become evident. One of water’s most paradoxical qualities is that when it changes into a solid it *expands* (and so becomes relatively lighter for its volume). Other substances, with the exception of bismuth, contract or condense and so become relatively heavier. Of course, if water condensed when it froze the world would have some serious problems. Ice would form on the bottom of a lake because it would be denser and therefore heavier than the liquid water. And there it would stay, growing upwards, killing all marine life. Underneath the surface, shielded from much of the sun’s heat, very little of it would melt in the spring and eventually the rivers, lakes and seas in cooler parts of the world would become solid ice.

The world would have different but even greater temperature problems if there were no water vapor in the air to absorb the sun’s heat during the day and retain it during the night. Daylight hours would be miserably hot, and nightfall would bring freezing temperatures. In southern states where winter crops are grown, farmers dread a cold, dry, clear night for this same reason. Without clouds and moist air to act as insulation, the earth’s heat quickly escapes, permitting the temperature to drop unusually low and sometimes ruin citrus fruit and tender plants with frost.

Water’s peculiar way of expanding when it freezes gives it another important but little-known role in agriculture. Because it collects in the minute cracks of rocks, it gradually breaks them up in the process of alternately freezing and thawing, and thereby assists in the lengthy weathering process that reduces rocks to soil.

Water not only refuses to obey the usual rules of chemical behavior in freezing and melting — it sometimes defies even its own rules. For example, water can be cooled below its freezing point of 32 degrees F. without freezing. If kept absolutely still it will remain a liquid to within a few degrees

THE CURIOUS WAYS OF WATER

of zero, but once disturbed freezes instantly. Similarly, water can be heated above its boiling point of 212 degrees F. without turning to steam. Under laboratory conditions it has been heated as high as 380 degrees F. When it finally does boil, however, it makes up for lost time by boiling with explosive violence.

Water's solvency gives it another unusual property. Most people consider water a good conductor of electricity, but in fact it's a terrible conductor and a good insulator. When someone standing in water gets a shock, it's not the water that conducted the electricity but the impurities dissolved in it. Pure water doesn't carry current, but it is such a good solvent for other substances that any moist surface is usually a good conductor.

Water's ability to dissolve most substances makes it a highly corrosive liquid, yet it is not only harmless to plants and animals but highly essential to their lives. It assists in all body processes, lubricates the joints, and is the key to the cooling system that keeps the human machine at just the right working temperature. In fact, the human body is nearly 60 per cent water, and a person drinks about 20,000 gallons of the liquid in an average lifetime.

Water's component parts, hydrogen and oxygen, are themselves interesting. Oxygen is a colorless, odorless, tasteless gas and by far the most abundant element. It can combine with practically every other element, and composes 21 per cent of the volume of the atmosphere, about 90 per cent of the weight of water, and about half the weight of the rocks in the earth's outer crust. Because it supports both respiration and combustion, it is the world's chief source of energy.

Hydrogen, also a gas, is the lightest and simplest of all

elements. The ordinary hydrogen atom contains a single proton and electron, which puts it in first place on the atomic chart of elements. Because the gas is so light it was once widely used in balloons, but because it is so inflammable and has resulted in some disastrous explosions balloons today are filled with inert helium.

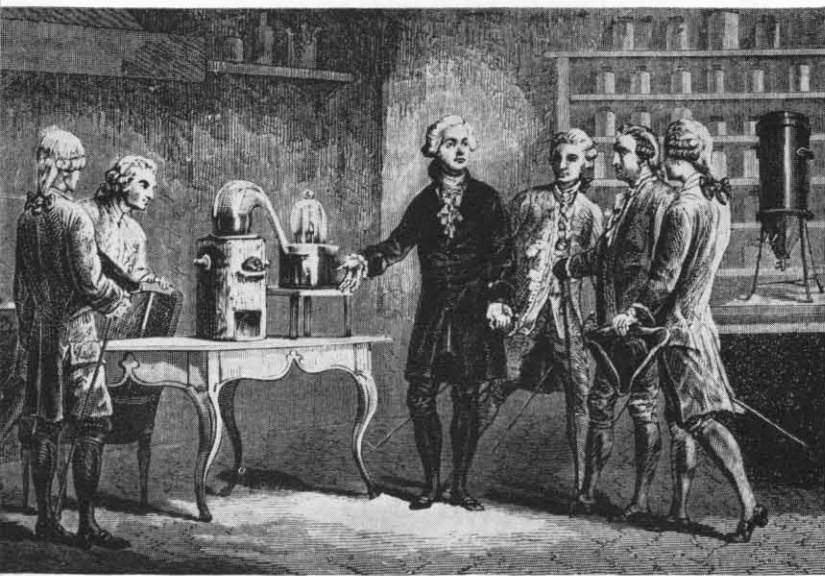
Hydrogen, however, is not quite the simple element it was once thought to be, and because of this scientists have made another surprising discovery about water — that its chemical formula is not always H_2O . In 1934 the American chemist Harold Urey discovered a second kind of water that contained deuterium, a special type of hydrogen. Instead of containing the usual one proton and one neutron, a deuterium atom also contains a neutron which nearly doubles its atomic weight. Thus water made of deuterium and oxygen is called "heavy water" and is given the symbol D_2O . Heavy water exists in ordinary water at a ratio of about 1 to 7,000, or about one ounce in fifty gallons, and it has slightly higher freezing and boiling points. It has proved extremely valuable in atomic research as a moderator to slow down nuclear chain reactions by absorbing the free neutrons that keep a chain reaction going.

Surprisingly, seeds won't sprout in heavy water and rats will die of thirst rather than drink it. According to a report in the Soviet newspaper *Izvestia*, the Russian biophysicist Boris Rodymov has made "pigs grow fatter, cows give more milk and chickens lay more and bigger eggs" by watering them only with melted snow, which contains less D_2O than ordinary water.

After scientists had adjusted to the idea of there being two kinds of water, English and U. S. researchers discovered there was a third. This is a "super-heavy" water containing tritium, which is a hydrogen atom with two additional neutrons in its nucleus. Tritium oxide is extremely rare, only one part occurring in one million million million parts of ordinary water. Tritium is radioactive and is important in the making of hydrogen weapons and atomic research.

The newest discoveries about water have been as curious as ever. Botanists have found, for example, that corn may show frost effects when the temperature is as high as 40 degrees, which is eight degrees above water's usual freezing point. Another discovery has been that natural gas pipelines can become clogged with a slushy "snow" containing water, which is puzzling since natural gas is practically insoluble in water. Stranger yet was the discovery that such inert gases as argon and krypton, which do not react chemically, can sometimes combine with water to form what resembles a chemical compound.

From past experience, water seems to have an unlimited amount of surprises in store for the chemists and other scientists who will be working with it in the future. Water was a common and simple enough substance when Joseph Priestley amused his friends by exploding some hydrogen in a bottle a century ago, but it hasn't been that way since. ■



In 1783, French chemist Antoine Lavoisier experimented with water and discovered that one of its two elements was oxygen.

Jet travelers to Saudi Arabia in the Middle East
are welcomed at the beautiful new

DHAHRAN INTERNATIONAL AIRPORT

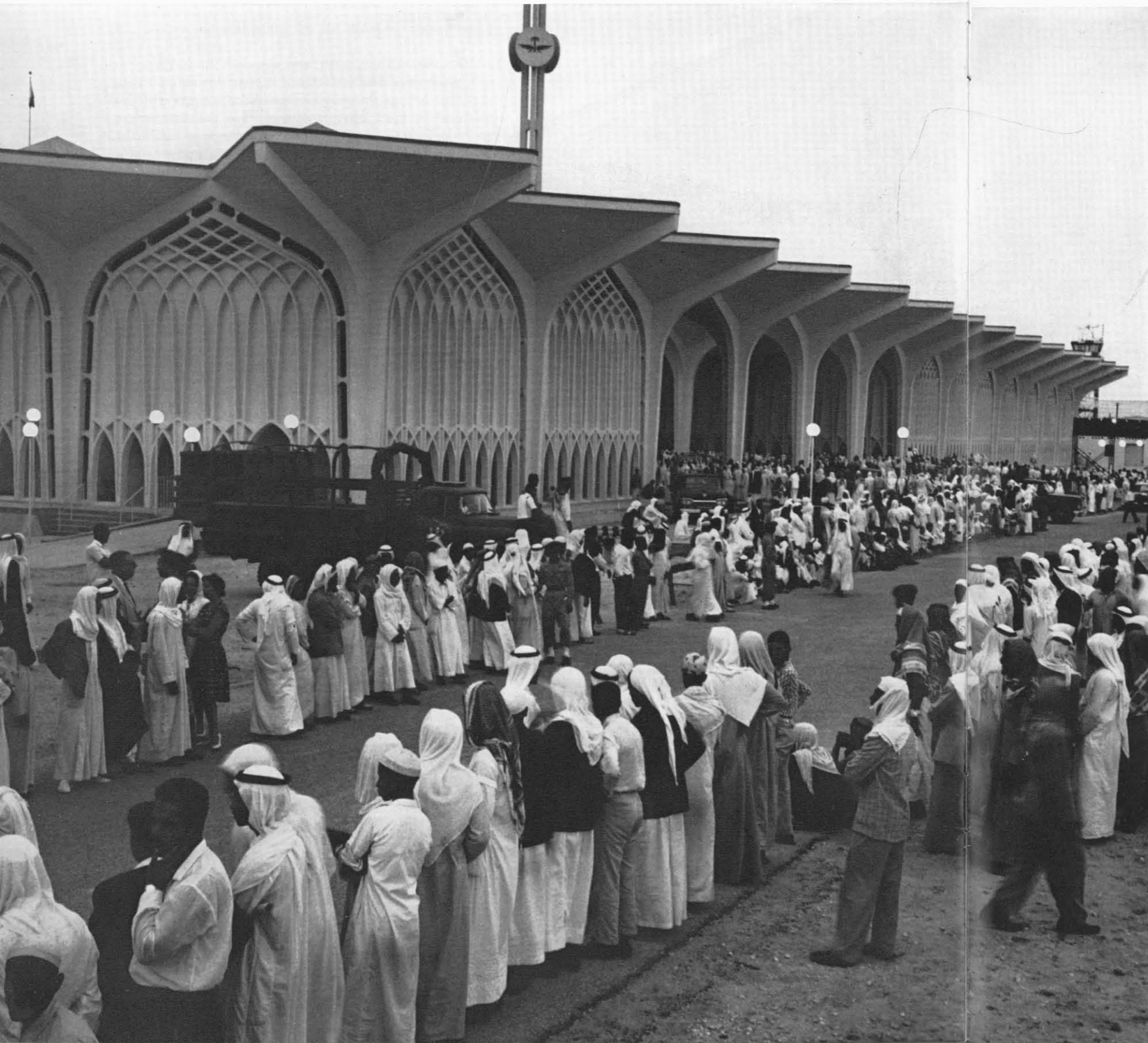
IN THIS JET AGE, a flat, arid parcel of Saudi Arabian real estate near the Persian Gulf is becoming an increasingly vital link connecting Europe and the West with India and the East. The presence of oil in the eastern part of Saudi Arabia has stepped up the tempo of local urbanization and commerce, and with it, air traffic from outside. More and more Saudi Arabs are traveling by air over the vast stretches of desert which separate Jiddah, Medina and Riyadh from the Kingdom's east coast population centers. The Dhahran International Airport, as it is now called, recently acquired a magnificent new terminal building befitting the importance of the landing field on world air routes. Designers of the structure tried to combine modern functionalism with a traditional Arabesque appearance appropriate to its setting. As the photographs on these pages demonstrate, they have been eminently successful in their efforts.



H. M. King Sa'ud of Saudi Arabia
cuts ribbon across the entrance of Dhahran
International Airport terminal
building at formal inaugural in April 1962.



DHAHRAN INTERNATIONAL AIRPORT



Royal Saudi Air Force jets perform a "fly-past" over the new terminal.



To make room for construction of the new terminal building at Dhahran International Airport, a hangar was "put on wheels" and towed by truck to a different location a quarter-mile away.

Crowds line the road in front of the new terminal building awaiting the arrival of H. M. King Sa'ud for the dedication ceremonies at Dhahran International Airport.

**DHAHRAN
INTERNATIONAL
AIRPORT**



Prior to departure, passengers report to the various airline check-out counters located in the lobby of the new terminal building.

Transient passengers landing at Dhahran International Airport can stop by the terminal building to enjoy a snack or a meal in air-conditioned comfort.



An Aramco employee has her passport checked at the Aramco Passport Service desk. In an average month, 400 Aramco employees and family members depart on business or vacations.

Flight "movements" in and out of Dhahran Airport every week by 13 international airlines make Dhahran an important air transportation center in the Middle East. Below, jetliners from Lebanon, Saudi Arabia and Japan stand on the runway in front of the main terminal building.





“Now it happened in the reign
of the mighty Haroun al-Rashid . . .”

THE SPLENDID SULTAN

THE CALIPH OF BAGHDAD held audience in an antechamber of his royal palace. The room was small but sumptuous, befitting the Commander of the Faithful, Haroun al-Rashid. No noises from the outside penetrated the plush brocade drapes from Syria. Thick Persian carpets muffled the sound of footfalls inside. Brilliant tapestries from Samarcand hung from the walls; shimmering gold figurines from the Horn of Africa stood on the shelves; there were pearls from Arabia, and bars of platinum from Malaya, and glossy furs from Russia.

Haroun al-Rashid sat at a table of polished teakwood from Ceylon. His robes were of the finest silk from China. To his right flickered an oil lamp from Egypt. He played idly with an ivory medallion from Zanzibar, while on his finger an enormous diamond ring from Turkestan glittered in coruscating colors.

It was like a scene from the *Arabian Nights*, the immortal anthology of tales in which Haroun al-Rashid appears so often as a character. But this time the Caliph of Baghdad was not playing a fictional role. He was dealing with the intricate problems of international diplomacy.

“The important thing,” said Haroun al-Rashid to the officials grouped around the table, “is to make my friend, the Emperor of the Franks, the mighty Charlemagne, realize how helpful we can be to one another.” He unrolled a map of the known world and flattened it on the teakwood. His officials leaned over the map as his finger traced the outline of continents, seas and empires as they were known in the year 803.

“Here, to our northwest on the Bosphorous,” the Caliph noted, “lies Constantinople, capital of the Byzantine Empire. The Byzantines, as we know, are rivals of the Franks. Therefore, Charlemagne is beholden to me for defeating the Byzantine armies and preventing them from driving west beyond the Balkans.”

“And we shall gain from the pressure exerted by the Franks on Spain?” said one of the officials.

“Exactly. The Umayyad Caliphate of Cordova challenges our Abbasid Caliphate for authority in the Islamic world. By invading Spain, Charlemagne has drawn the Umayyad power from the Mediterranean to the Pyrenees. We hope that he will continue to harry their Pyrenean frontier.”

The officials nodded. “We understand,” said one, “and are ready to leave for Aachen on the Rhine. We will repeat your sagacious words to the Frankish barbarian.”

Haroun al-Rashid smiled. “Barbarian? Yes, Charlemagne can barely write his name, according to reports. Nevertheless, do not underestimate him. He has, after all, built an empire. Tell him that I wish I were in Aachen, or he in our own city of Baghdad.”

This meeting, held over a thousand years ago, is regarded by scholars today as one of the piquant moments of history—the planning of a ninth-century summit conference between the slim dark Sultan Haroun al-Rashid and the tall blond Emperor Charlemagne. Unfortunately, the two most imposing personalities of their time never met.

They *did* exchange embassies. The diplomats of Haroun al-Rashid astounded Charlemagne and his court when they arrived in Aachen with gifts that included spices, perfumes, a water clock and, according to one report, an elephant.

Haroun al-Rashid, for all the *Arabian Nights* fantasy that surrounds his legend, was a diplomatist of the highest order. He understood international politics better, probably, than any other man of the ninth century. His liaison with Charlemagne across so much space and time proves this. Aachen lay far from Baghdad, off in the middle of Europe, in the depths of the Rhine forests. Yet the Caliph was astute enough to propose an alliance with Charlemagne, an alliance firmly cemented by mutual self-interest, and an alliance that worked.

Haroun al-Rashid kept the Byzantines occupied while Charlemagne ruled as Emperor of the Western Empire. Charlemagne kept the Umayyads occupied while Haroun al-Rashid ruled as Caliph of the Abbasid Empire.

Haroun al-Rashid was the grandson of the great Caliph al-Mansur who built Baghdad. He inherited much of al-Mansur’s military ability, and as a young man made a name for himself in the Byzantine wars. Only 22 when he became Caliph in 786, he was accepted by the soldiers of the army and the people of Baghdad. He reigned until 809, the most spectacular 23 years in the annals of the Caliphate—years forever memorable in history and romance.

The Sultan based his imperial power solidly on the realities of war, diplomacy and economics.

His armies bivouacked at strongpoints along the frontiers. The most important of these barred the way from the Anatolian Plateau into Armenia and Persia, blocking the advance of Byzantine power. The other, in central Asia, held in check the Mongols of Khorasan who threatened to invade Persia from the east. Here Haroun al-Rashid took the field in person, hitting the Mongols first, and driving them back into the steppes beyond the Caspian.

While the armies of the Caliph were fighting, his diplo-

In his Baghdad palace
Sultan Haroun al-Rashid receives trade
emissaries from a famous contemporary,
Charlemagne, Emperor of the Romans.