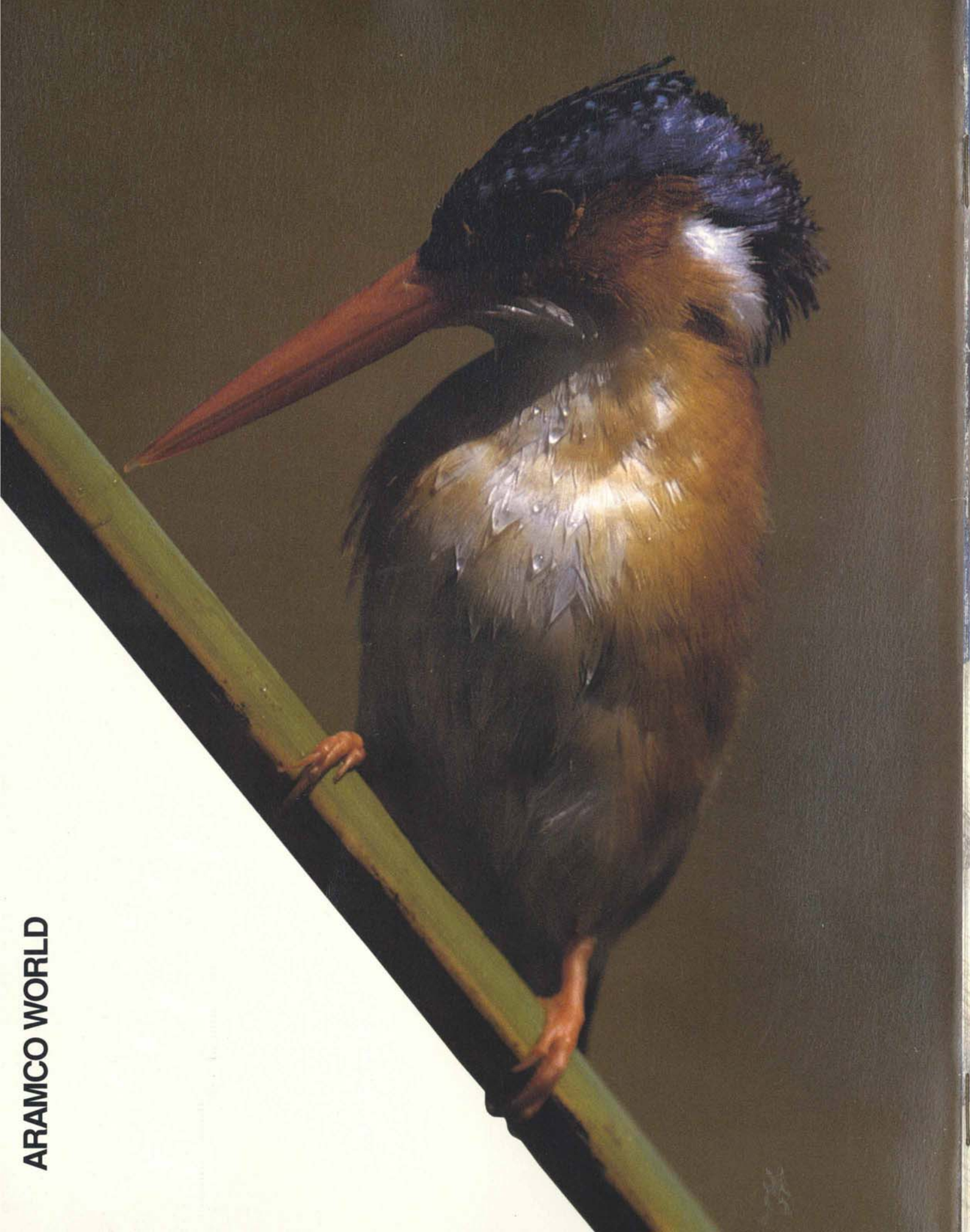

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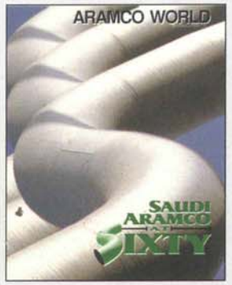

Cover: Curves of silver-painted pipe in Saudi Aramco's Berri Gas Plant point the way into the future for the world's largest exporter of crude oil and natural gas liquids. The plant processes more than half a billion standard cubic feet a day of gas produced in association with crude oil. Photo: S. M. Amin.
Back cover: Water droplets from his last dive spangle the breast of a malachite kingfisher. Birders found this African species apparently breeding in southern Arabia. Photo: G. D. Plage/Bruce Coleman

◄Sun and shadow pattern a gallery of the spring-fed Adalaj Vav.

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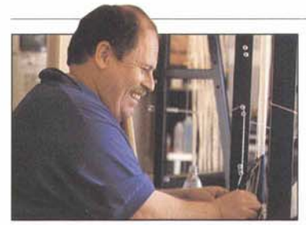
MARTINS




ERKANAT


STONE


CLARK


KESTING

AN INVENTORY IN ARABIA FELIX

WRITTEN BY ROD MARTINS

ROD MARTINS

M. BORLAND/BRUCE COLEMAN

Dawn mist reveals the rugged slopes of Jabal Iraf (left), located on the former border between North and South Yemen and potentially an ideal site for the unified country's first national park. The malachite kingfisher, an African species, above, was nonetheless found near the mouth of Yemen's Wadi Hajar.

Some borders on this map have not been fully defined.

The highlands of southwestern Arabia surprise most Westerners.

The region, much of which lies within the borders of today's Yemen, was once called "Arabia Felix" – literally, Fertile Arabia – and its spectacular scenery, ecological diversity and rich cultural traditions justified the name. It is a fascinating land (See *Aramco World*, May-June 1981).

Here flourished important civilizations of antiquity – the Sabaean, Minaean and Himyaritic, among others – and here, during a fine flowering of Islam's civilization, early advances in algebra, astronomy and other fields were made under the Rasulid dynasty in the 13th, 14th and 15th centuries. The city of Zabid, in particular, was a veritable Islamic Oxford, with some 230 schools and colleges devoted to the arts, sciences and Qur'anic studies.

Since ancient times, mariners of this region traded extensively with the East African coast, the Indian subcontinent and the islands of present-day Indonesia. Chronicles of their travels are often the earliest written descriptions of the lands rimming the Indian Ocean.

Changing trade patterns eventually relegated southwestern Arabia to the fringes of international commerce. For most of the 20th century, rulers of the region remained wary of outsiders, and discouraged foreign visitors. Few students of the natural sciences penetrated the western ramparts of Yemen's mountains – and many of those who did failed to return, their expeditions succumbing to the ravages of disease, or foundering on personal conflicts.

In recent times, however, circumstances have changed. In 1985, for example, the Ornithological Society of the Middle East (OSME), working with several institutions in Yemen, initiated a two-month program of field research in southwestern Arabia, focusing on Yemeni ecology and the prospects for conserving the region's rich endemic bird life. At that time, fieldwork was possible only in North Yemen. But after the unification of the two Yemens in May 1990, OSME could finally realize its longstanding plan to undertake complementary fieldwork in what had been South Yemen.

After months of careful preparation, an international team of 18 ecologists and ornithologists arrived in Yemen last March, working under the guidance of OSME with the support and sponsorship of Britain's Royal Society for the Protection of Birds (RSPB) and BirdLife International, and of Yemen's Environmental Protection Council (EPC). Richard Porter of the RSPB, an elder statesman of Middle Eastern conservation, headed our group; he was assisted by Arabist Francine Stone and myself.

ROD MARTINS

A black-headed bush shrike, caught in an expedition mist-net, is held gently for examination. Mist-netted birds rarely struggle, and seem no worse for wear when released.

"Yemen is something of a paradox to conservationists," notes Porter. "It's a developing country with a large population, so it's a welcome surprise that the Yemeni authorities are so eager to implement conservation measures and encourage research. In fact, they see it as a natural extension of the Islamic view of life."

One practical demonstration of these beliefs was the government's appointment of Yemeni environmental scientist Dr. Omar al-Saghier as the team's strategic advisor. In exchange, expedition participants shared their conservation experience and knowledge of field investigation techniques with Saghier and his Yemeni colleagues.

As we left the capital, San'a', and headed south, one of our first priorities was to examine the status of Yemen's famous wintering population of the extremely rare bald ibis, *Geronticus eremita*. Following the extinction of Asia's last remaining wild population of this species, at Birecik in southeast Turkey (See *Aramco World*, November-December 1989), the bald ibis can now be found only in Morocco and Algeria, and perhaps in Ethiopia. According to Turkish legend, this bird, migrating southward, guides the souls of the departed to Makkah; in another tale, as the bird freed from the ark by Noah, it is a symbol – ironically – of fertility.

For many years, however, there have been occasional sightings of the bald ibis in Yemen: The bird is mentioned in Hugh Scott's famous *In the High Yemen*, which describes the author's travels before the Second World War, for example. An earlier OSME expedition confirmed that a small population regularly winters in a unique complex of wetlands in the valleys and hills surrounding Ta'izz. Here the very high annual precipitation, typical of the southern uplands of northern Yemen, keeps the water table high, and surface water is not unusual. We were delighted, in our turn, to find new marshland areas around Ta'izz which provide suitable feeding grounds for the bald ibis, and helpful local residents who know the bird well suggest that more sites await discovery. This is most encouraging news, as Yemen's recent rapid development and growth has had a radical negative effect on the birds' feeding areas, with many being drained and put to the plow – a classic illustration of the mounting pressures on rare species and their habitats in southern Arabia. It symbolizes the problems which have, until recently, beset conservationists throughout the region.

Yet even after the momentous discovery of the species' wintering grounds in Yemen, the mystery surrounding the bald ibis persists: Where does *Geronticus eremita* breed? Yemen's population of the birds must come from an area that provides the species' habitat requirements: rocky cliffs and permanently watered wadis. The most likely locales, ornithologists speculate, include the well-watered region between Ta'izz and al-Turbah, in former North Yemen, or perhaps some quiet corner of the Dhofar region, most of which lies in Oman. Much more fieldwork, and perhaps a little luck, will be required before the breeding site – the "Tutankhamun's tomb" of Arabian ornithology – is discovered.

ROD MARTINS

A OSME researcher examines a bird to determine its sex and estimate its age, important data for population studies.

Opposite, a pair of red-backed shrikes perches in a blackberry bush. This species breeds in Europe (where this photograph was taken) and migrates along the Red Sea and through Yemen.

HANS REINHARD/BRUCE COLEMAN

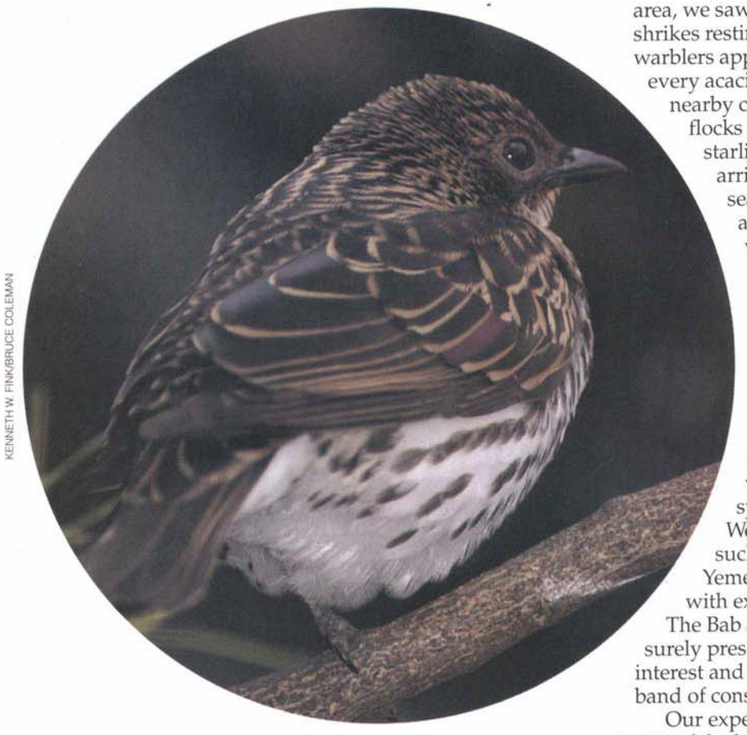
One of our expedition's chief objectives was to identify "important bird areas" in Yemen: sites of crucial importance to bird conservation that merit inclusion in a future network of protected areas. A project underway throughout the Middle East, jointly undertaken by BirdLife International in Cambridge and a network of Middle Eastern contributors, will publish a list of sites in book form before the end of 1994. We identified a total of 11 areas that may be added to the list.

We located one such site as the expedition traveled south from Ta'izz along the coast south of Mocha, between Dhubab and the cape at Bab al-Mandab. Here a whole, diverse series of habitats, all typical of the Yemeni Red Sea coast, occurs within one small area. Most of the shoreline here slopes very gradually and there is much deposition of silt that produces extensive open mud flats, combined with stands of both newly colonizing and mature mangroves. These habitats constitute an attractive staging point where millions of migratory birds – mostly shorebirds that travel the Red Sea flyway between Eurasia and Africa each spring and autumn – can stop to rest and feed. The site's location close to the Bab al-Mandab enhances its importance; OSME-sponsored research in Djibouti, on the African side of the Red Sea, recently demonstrated the significance of the area as a route for migrating birds of prey. Many thousands cross the narrow straits each autumn at Bab al-Mandab, bound for the African mainland.

There are thus many reasons for considering this part of the Yemeni coastline of crucial importance to migratory birds. During our visit, migrants were everywhere: In one small bush by the checkpoint at the rocky promontory of the Bab al-Mandab itself, we found red-backed shrikes, whitethroats and several willow warblers; driving along the dusty roads in the area, we saw more exhausted red-backed shrikes resting in the open desert. Barred warblers appeared to be calling from almost every acacia. In a grove of large trees in a nearby cultivated wadi, we found small flocks of golden orioles and amethyst starlings, as well as an exhausted, newly arrived gray-headed kingfisher. At sea, small flocks of pomarine and arctic skuas were traveling westward along the Arabian Sea coast, rounding the Bab al-Mandab and heading northward up the Red Sea on their way to Arctic breeding grounds.

Even from the limited evidence we gathered during the expedition's short visit, it is clear that the Bab al-Mandab and its coastal environs represent a migration watchpoint that badly needs systematic, prolonged monitoring. We look forward to the day when such monitoring is conducted by young Yemeni ornithologists, perhaps working with expert colleagues from overseas. The Bab al-Mandab and its surroundings surely present the ideal location to spark the interest and enthusiasm of Yemen's growing band of conservationists.

Our expedition's next task was an investigation of the habitats and bird fauna of Jabal Iraf, a mountain site located exactly on the old border between the two Yemens and thus, until recently, inaccessible. Botanical studies have identified this as a site of great interest. Here we conducted population surveys in a small area of about four square kilometers (1.5 square miles) of juniper forest on the mountain's summit (See *Aramco World*, July-August 1989). The area held good populations of several of southwest Arabia's important bird species, including Arabian partridge, Arabian woodpecker, Yemen warbler, Arabian waxbill and golden-winged grosbeak. It is also home to a



KENNETH W. FINK/BRUCE COLEMAN

The amethyst starling is another species that migrates through Yemen and helps make the area around the Bab al-Mandab an "important bird area." Female, above, shows only a shade of the male's rich purple color.

DALE & MARIAN ZIMMERMAN/BRUCE COLEMAN

TOM BRAKEFIELD/BRUCE COLEMAN

large troop of hamadryas baboons which, outside Arabia, occur only in northeast Africa.

The impact of human activity down the centuries has largely destroyed the original forest which existed on the better-watered tops of the Yemeni highlands, so the survival of this unique area – partly because of its relatively small human population – is exciting and welcome news for conservationists.

Once the area had been extensively surveyed, it became clear that Jabal Iraf represents an ideal location for Yemen's first national park. The high scarps of the mountain, nearby peaks that still await our investigation, the Tihamah foothills below and the Tihamah plain itself, stretching to the coast, together represent a natural "textbook" of enormous scientific value, for they show the country's best-preserved altitudinal succession of vegetation types and plant associations.

Proposals for such a park are currently being developed. Following the example of Saudi Arabia, Oman and other Gulf countries that are already defining and protecting networks of important sites, the Yemeni authorities are keen to keep pace with current environmental thinking in the Peninsula, and Jabal Iraf will surely feature in their plans.

Our team traveled eastward along the entire length of Yemen's southern coast, as far as the border with Oman, to assess several key sites that have received little attention from ornithologists since the days of the British administration of Aden and its hinterland.

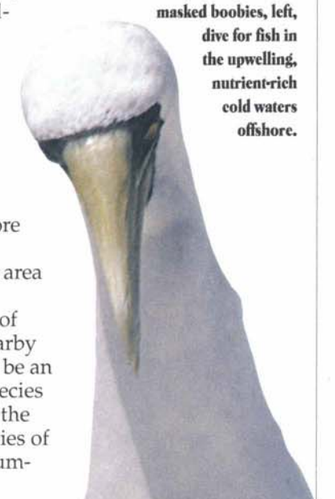
We surveyed the extensive mud flats in Aden harbor, clearly another important staging post for migratory shorebirds. Moving farther east, we located an especially interesting area at the mouth of Wadi Hajar, the only permanently flowing watercourse to reach the sea between Aden and Mukalla. Construction of a dam, usually a damaging activity from a conservation perspective, has created an interesting complex of wetland habitats, and our time in the field here was rewarded with some unusual observations.

A white-breasted waterhen discovered here was the first known occurrence of this species in Yemen. While individual records of so-called vagrants such as this are generally of little scientific value in themselves, they do sometimes reflect major changes in distribution of a species. Farther east, in Asia, the white-breasted waterhen has expanded its range remarkably in recent years – a development perhaps related to the growing number of records from the Arabian Peninsula during the same period.

Even more astonishing was the discovery here of a pair of malachite kingfishers, which behaved as if they were breeding. This would be the first known breeding record of the species not only in Yemen or in Arabia, but for the entire Asian continent. As there is one historical (non-breeding) record from former South Yemen, our sighting was a timely reminder that true African birds can stray to Arabian shores more frequently than previously thought.

Much farther along the coast, the area around Ras Fartak provided more ornithological surprises. A complex of small lakes and inlets behind the nearby beach at Abdullah Gharib proved to be an important roosting area for many species of marine birds found in this part of the Indian Ocean. We saw up to six species of terns regularly, and the very large num-

Yemen and its waters serve various marine birds at different stages of their lives. The red-billed tropicbird, opposite, breeds in the area of Ras Fartak; large numbers of sooty gulls, inset opposite, feed near the coast in the years before they reach maturity; masked boobies, left, dive for fish in the upwelling, nutrient-rich cold waters offshore.



ERWIN AND PEGGY BAUER/BRUCE COLEMAN

At right, Yemeni scientific officer Dr. Omar al-Saghier, advisor to the OSME expedition. The African scops owl, opposite, inhabits the Shahrut Hills of Yemen, and may breed there.

bers of immature sooty gulls along the beaches illustrated the importance of Yemen's coast as a feeding area for young birds that are not yet ready to return to their breeding areas around Oman and in the Arabian Gulf. We also found the scarce red-billed tropicbird breeding at two localities in the Ras Fartak area, representing an interesting extension of the species' known range in the region.

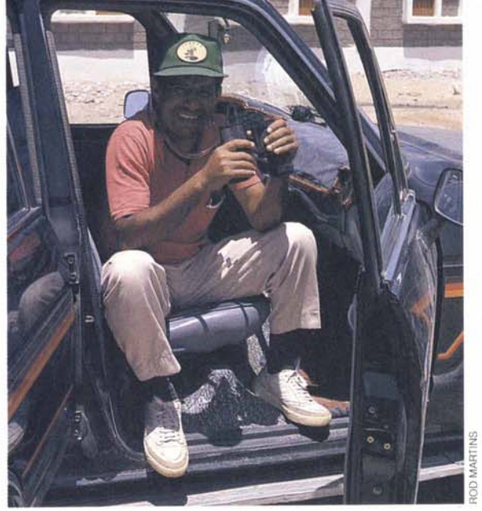
The beaches along this part of the coast were frequently pitted by the diggings of hundreds of turtles of at least two species – loggerhead and green – which find a safe haven here for laying their eggs. Happily, the local people protect the turtles in what may prove to be their most important nesting area on the south coast of Arabia. Often we could see these great reptiles from the cliffs and headlands, their ease and grace in the clear waters below belying their cumbersome progress on land.

Reaching the "far east," adjacent to the Oman border, we spent several days investigating the habitats and bird life of the small part of Dhofar that extends into Yemen. In Dhofar, a distinctive region of south coastal Arabia, the summer monsoon brings substantial rainfall to the continuously forested limestone scarps of the Dhofar mountains, pitted with caves and sinkholes. These seaward-facing slopes constitute a region of special interest because the distinctive range of habitats here, as on the western scarps of the southwest Arabian highlands, supports many of Yemen's essentially African breeding birds.

A Rüppell's weaver in hand.

ROD MARTINS

Offshore, the abundance of feeding seabirds, whales and dolphins demonstrates the extraordinary biological productivity of the marine ecosystem along the Dhofar coast. The upwelling of nutrient-rich cold water from the ocean depths is responsible, and makes these coastal waters important feeding grounds for Audubon's shearwaters and Socotra cormorants. While the shearwaters were normally in small feeding flocks, we sometimes saw the cormorants offshore in very large flocks. They would assemble in dense swarms where fish shoals came near the surface, animated by the frenzy of mass feeding. We did not find any local breeding colonies, although it seems possible that some might exist on Ras Fartak. Other notable species we observed from onshore included the wedge-tailed shearwater, the flesh-footed shearwater and the masked booby.



ROD MARTINS

Our studies of the bird life of the Dhofar coast culminated in an offshore survey by fishing boat. More than 20 kilometers (12 miles) offshore, we located substantial feeding concentrations of the little-known Jouanin's petrel. First described in 1955, this species' breeding grounds still await discovery, and may well lie within the mountains of Dhofar. Jouanin's petrel is presumed to return to its breeding colonies only at night, like many other deep-water seabirds, so much more exploration is needed in Dhofar before the true picture can be established.

On the Dhofar coast itself, we identified the seaward slopes of the Shahrut Hills near Hawf as an important bird area. The bird life here, like that of the western slopes of the southwest Arabian highlands, is strongly influenced by the nearby African continent, and many species migrate from there to breed in Dhofar during the spring and summer. Although the hills are well-forested, their ground vegetation is clearly under intense pressure from grazing goats and cattle. Grazing damage, perhaps aggravated by the lack of rains in recent years, has destroyed the normally rich ground flora so characteristic of Dhofar; in some places, only bare earth remains. The area would probably recover after a good rainy season, but the damage illustrates the need for some kind of conservation management strategy for this distinctive region.

Despite these problems, the Shahrut Hills still support the most extensive forests in Yemen. We recorded the existence here of important populations of some of the scarcer African species breeding in the country, such as the African scops owl and didric cuckoo, and found extremely high population densities of scarce species like the Arabian partridge and golden-winged grosbeak. As a result of the expedition, recommendations will be made to the Yemeni Ministry of Agriculture and the Environment to include the previously unsurveyed Shahrut Hills in the network of protected areas or national parks currently being prepared for the entire country.

The 1993 expedition amplified and extended the work undertaken in 1985 and gave us a proper understanding of the priorities for conservation and ornithological research in Yemen. As with any major research project, however, completion of the field-work merely sets the stage for the next, perhaps more important, phase: translation of the field observations into a strategy for future action.

OSME is fortunate that the expedition worked closely with several ongoing Yemeni initiatives for conservation and environmental awareness – efforts spearheaded by the Environmental Protection Council. A good example of cooperation between the EPC and OSME is the recent publication of a book on the birds of Yemen for the country's schoolchildren, part of a broader effort to heighten the interest of young Yemenis in wildlife and the environment. The aim, of course, is to advance the day when there will be enough experienced local conservationists to take full charge of Yemen's conservation program. Until that happens, the work of the expedition will not be complete.

Ornithologist and author Rod Martins was also a member of OSME's 1985 expedition to Yemen; his fascination with birds and wildlife has taken him to more than 30 countries.

BRUCE COLEMAN

A.K.A

COMMON AND SCIENTIFIC NAMES OF BIRD SPECIES MENTIONED ON THESE PAGES:

Black-headed Bush Shrike	*Tchagra senegala*
Bald Ibis	*Geronticus eremita*
Red-backed Shrike	*Lanius collurio*
Whitethroat	*Sylvia communis*
Willow Warbler	*Phylloscopus trochilus*
Barred Warbler	*Sylvia nisoria*
Golden Oriole	*Oriolus oriolus*
Amethyst Starling	*Cinnyricinclus leucogaster*
Gray-headed Kingfisher	*Halcyon leucocephala*
Pomarine Skua	*Stercorarius pomarinus*
Arctic Skua	*Stercorarius parasiticus*
Arabian Partridge	*Alectoris melanocephala*
Arabian Woodpecker	*Dendrocopos dorae*
Yemen Warbler	*Parisoma buryi*
Arabian Waxbill	*Estrilda rufibarba*
Golden-winged Grosbeak	*Rhynchostruthus socotranus*
White-breasted Waterhen	*Amaurornis phoenicurus*
Malachite Kingfisher	*Alcedo cristata*
Sooty Gull	*Larus hemprichii*
Red-billed Tropicbird	*Phaethon aethereus*
Audubon's Shearwater	*Puffinus lherminieri*
Socotra Cormorant	*Phalacrocorax nigrogularis*
Wedge-tailed Shearwater	*Puffinus pacificus*
Flesh-footed Shearwater	*Puffinus carneipes*
Masked Booby	*Sula dactylatra*
Jouanin's Petrel	*Bulweria fallax*
African Scops Owl	*Otus scops senegalensis*
Didric Cuckoo	*Chrysococcyx caprius*
Rüppell's Weaver	*Ploceus galbula*

FROM KILIMS TO CALLIGRAPHY

MICHAEL H. RUBIN

"I started weaving when I was four or five," recalls Turkish-American artist Jeyhan Mehmet Rohani, his eyes sparkling. "Instead of paper to draw on, we got scraps of wool and little frame looms on which to work."

Rohani weaves Islamic calligraphy – an art usually reserved for paper and ink – into his woolen tapestries. His work ranges from *namazlık*, or prayer rugs, to mirrored texts from the Qur'an, written in Kufic script and washed in watercolor tints, to colorful zoomorphic creations with *bismillahs*, or invocations of God's name, fashioned into peacocks and falcons.

"I believe Rohani is the only full-time Islamic weaver in this country," observes American calligrapher Mohamed Zakariya (See *Aramco World*, January-February 1992). "He's really in tune with what's going on in tapestry today. I respect what he's doing."

Rohani and Zakariya have collaborated on tapestries like "Verse With Tulip," where the calligraphy is set in a border of crimson and yellow tulips on a green background, evoking grass swaying in a breeze. In 1991, Rohani's "Ayat Al Kursi" was one of some 400 artworks selected from over 7000 pieces to appear in *Fiberarts Design Book Number Four* – a rare distinction for a Muslim artist in America.

Rohani's work has been exhibited throughout the western United States. Last year, he received the Human Excellence Award for Arts and Culture from San Francisco's Muslim Community Center. His creations have been purchased for homes and businesses in North America and elsewhere. One tapestry, with an Ottoman astronomy theme, was commissioned by the Vancouver Planetarium.

Rohani, born in Los Angeles in 1949, was taken back to his family's Turkish homeland at age three; he grew up in eastern Anatolia, where his relatives were accomplished weavers of kilim carpets and other textiles. He was inspired by his grandfather's collection of fine Turkish and Arabic calligraphy.

Among Rohani's most vivid memories are the rows of women working at looms in the workshops of his aunt's cooperative. Rohani began his formal weaving education there when only 10 years old.

"This early influence led me to create in wool what would normally be done on paper," he explains. "My love for weaving and calligraphy started with the tapestries, other woven work and calligraphic designs that I saw as a child in Turkey – beautiful things that we just don't have in the West."

In 1963, Rohani returned to America. He continued to weave tapestries for the cooperative back in Turkey, and experimented widely in textiles, even working with Navaho designs. In 1981, he began studies under French-Argentine master weaver Jean Pierre Larochette.

Islamic calligraphy has always held a special place in Rohani's heart. His work blends traditional script with unusual motifs and stylizations, including marbleizing techniques that imitate swirled marks of pigments floated on water.

At his California studio, Rohani works his loom from eight to 14 hours a day, taking up to nine months to complete a large piece. He weaves each tapestry in sections, building patterns in selected areas with bobbins of brilliant colors or basic black.

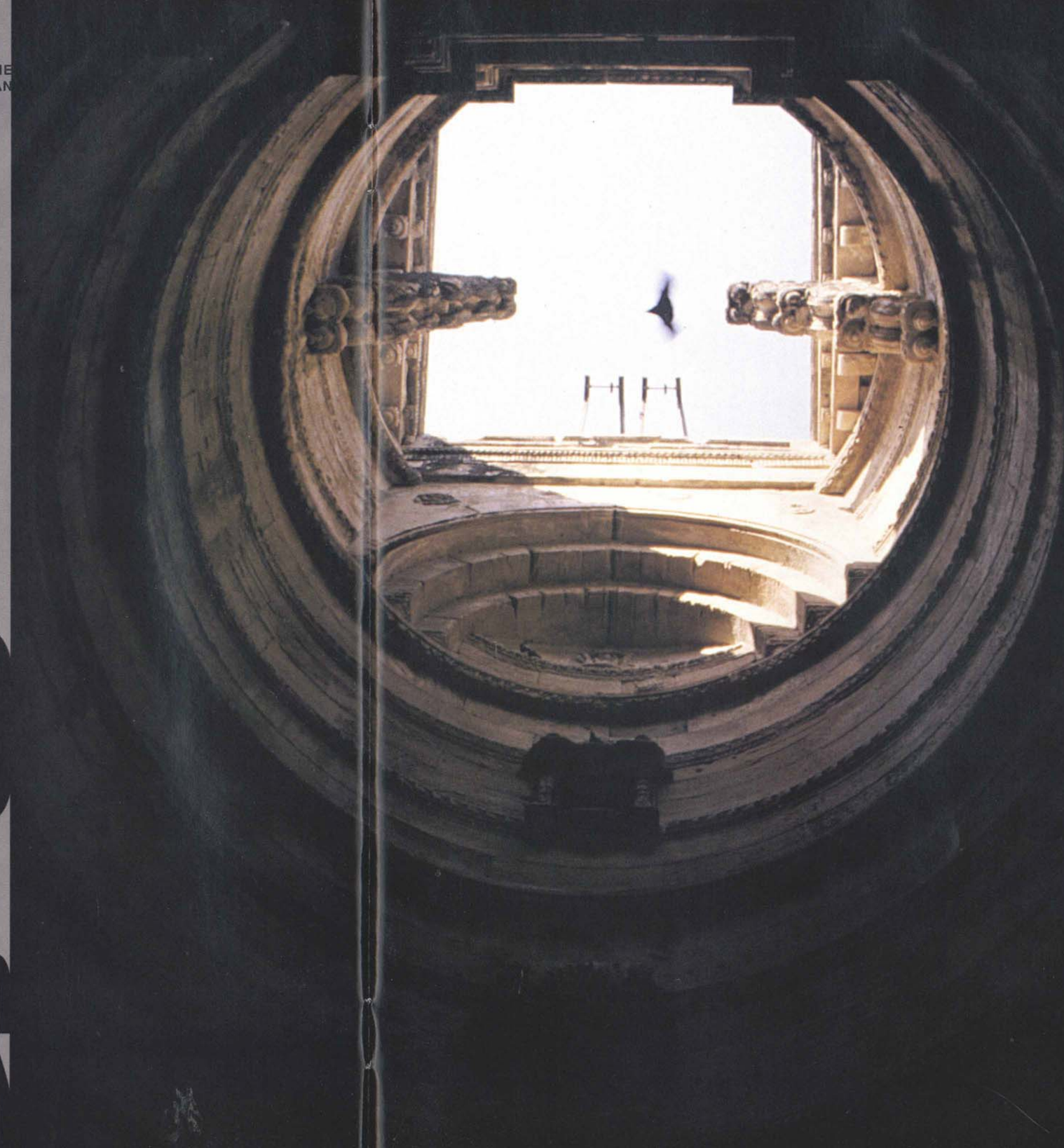
"I validate my Turkish heritage, and myself, in my tapestries," he declares. "I also practice my *du'a'* [personal prayers] through my art. I want to reach not only my fellow Muslims, but non-Muslims as well. I hope my work leaves them with an emotional understanding of the spirit of Islam." ⊕

Judy Erkanat, a free-lance writer in San Jose, California, recently became president of a statewide Turkish-American association.

WRITTEN AND PHOTOGRAPHED BY JUDY ERKANAT

WRITTEN BY CAROLINE STONE
PHOTOGRAPHED BY ILENE PERLMAN

DEEP RETREATS



Perhaps because of its desert origins and its emphasis on cleanliness and purity, Islam has always sought to conserve and manage water resources. Muslims have time and again brought innovations in water management to the countries in which their faith has flourished. India is no exception.

Hindu India was already quite concerned with the problems of water and irrigation when the Muslims arrived in AD 1001; but the Muslims brought with them important new ideas, and greatly extended the existing water supply systems.

Before Islam, India had numerous artificial lakes, many built as reservoirs; almost every city in the northwestern state of Rajasthan can boast of one. There were also tanks, large, occasionally very large, rectangular pools, often associated with temples, that sometimes enclose a spring and are reached by stone steps; their focus is on assuring ritual purity rather than simply providing water for drinking, for animals or for irrigation.

The coming of Islam brought a new stage in the construction of tanks: the *baoli*, or step-well. Its origins are unclear. *Baolis* do not seem to exist outside India; they may have been known in some form in Central Asia, but have gone unrecorded. More likely they are an elaboration of a simpler kind of step-well found in northern India.

The northern version of the *baoli* generally consists of a rectangular stone or brick cistern, with a broad flight of stone steps running from ground level down into the water along one side of the well, sometimes with secondary flights of steps, also underwater and running opposite and at right angles to the main flight. These *baolis*, while often quite impressive in size, are usually unadorned and architecturally plain.

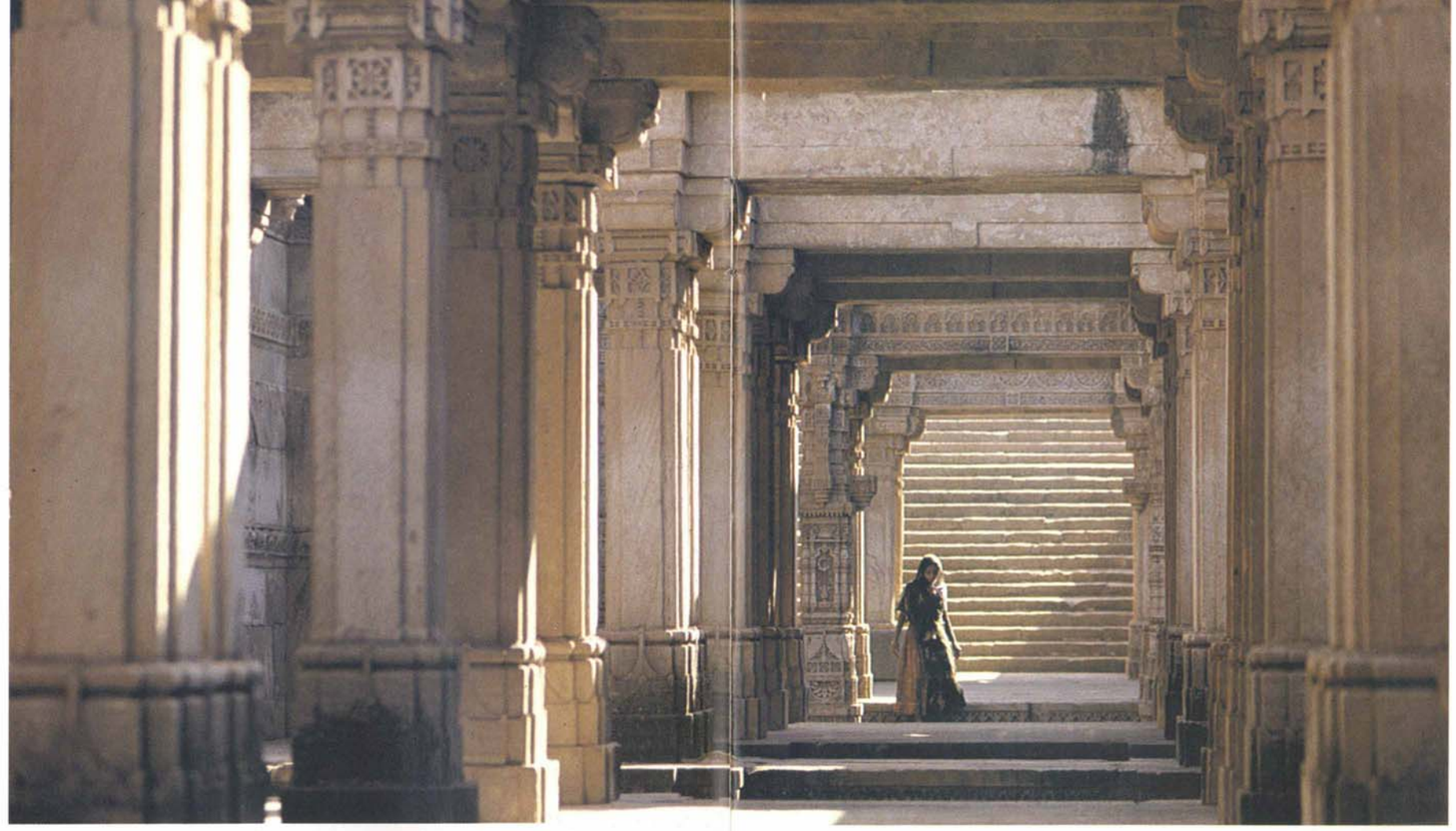
The most interesting *baolis*, from an artistic and architectural viewpoint, are those found in western India. Essentially, the western *baoli* is a whole subterranean building, constructed around a very deep well that sometimes extends down more than 50 meters (165 feet). The well's circular or octagonal shaft is reached by flights of steps linking underground galleries or chambers that open onto the shaft. The lower reaches of the well, including galleries, may flood during the monsoons or other heavy rains, but the water, no matter what its level, always remains conveniently accessible.

Baolis have other advantages: The water, because it is so deep and so protected, is kept pure and safe from contamination by trash, drainage or animals – a factor of great importance in efforts to preserve the health of the community.

The early Muslim conquerors of India were probably aware of such health factors, and the later ones certainly were: Their records refer often to water and air quality, and they had ways of testing both.

In the case of air, for example, it was customary before establishing a major camp, to hang up carcasses of sheep – similar in age and condition and slaughtered at the same time – at various locations and to study what happened to them. The place where the carcass lasted longest without signs of decay would be chosen as the campsite, on the grounds that the air there was freshest and most healthful.

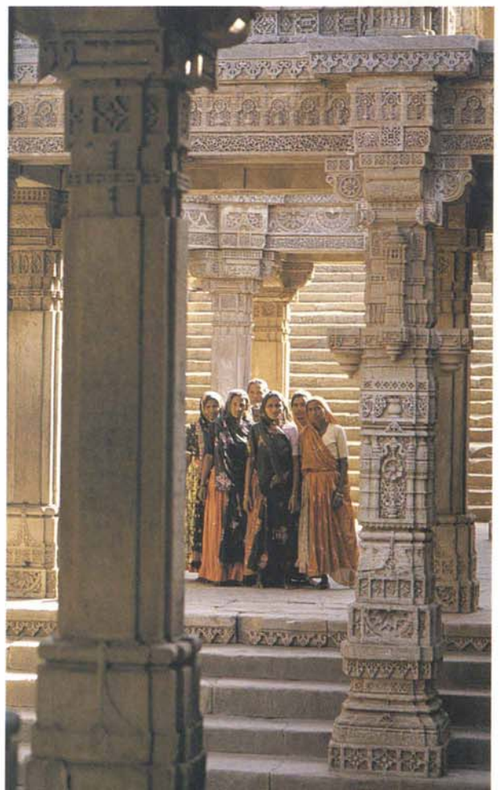
In the case of water, samples would be examined for detritus, insects and plant life. Experts would assess the camp's distance from springs and other water sources, and determine whether the supplies had been contaminated by seepage from garbage dumps or graveyards.



Five floors of subterranean galleries open onto the octagonal central shaft of Adalaj Vav, above.

Previous spread: A bird flies across the opening of Adalaj Vav's central shaft, viewed from the depths of the well. Above: A woman keeps her balance as she eyes the lower levels from one of the Adalaj galleries.

Colorfully clad visitors stand amid the square columns at Adalaj, right. Far right: Children enjoy the elephants of Adalaj's carved stone reliefs, seen here in close-up.



Baolis made the task of fetching water much easier, and provided a cool and pleasant retreat where people could sit, perhaps even work, during the hottest part of the day – something of no small importance in an area where temperatures can exceed 50 degrees Celsius (122° F). Many *baolis* are rather efficiently provided with light shafts, at least at the higher levels. The relief and pleasure of entering a *baoli* and escaping from the dust and glare of a hot summer's day is enormous; within minutes, wilting small children – Indian as well as foreign – begin to revive. In past centuries, *baolis* were probably reserved for women and children at certain times of day; some of them were endowed by women – generally a woman of the ruling house, since building one was a costly enterprise.

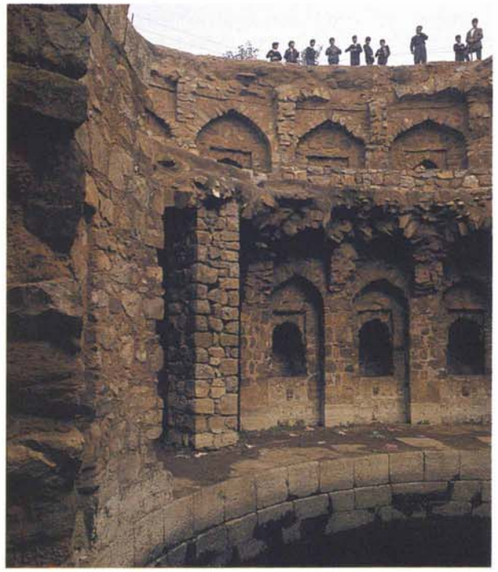
Step-wells were also often intended for travelers. The Muslim rulers of India, particularly the Moghuls of the 15th to 18th centuries, built and endowed fine roads, equipped with mosques, rest houses and wells. These facilities were especially common on the main arterial road, which would, as it happens, also have been used by Muslim pilgrims on their way to Makkah. Doubtless much of this construction consciously imitated the great pilgrim road across Mesopotamia and northern Arabia to Makkah, built by the consort of Abbasid Caliph Harun al-Rashid and called the Darb Zubaydah, or Zubaydah's Way.

Here is a Muslim ruler's description of digging a *baoli* – also known in India as a *wain* or *vav* – at Agra in 1525:

"Three things oppressed us in Hindustan, its heat, its violent winds, its dust. Against all three, the Bath is a protection, for in it, what is known of dust and wind? and in the heats it is so chilly that one is almost cold.... In an empty space inside the fort, which was between Ibrahim's residence and the ramparts, I ordered a large chambered well to be made, measuring 10 by 10 [roughly 10 meters square, the approved measurements for an ablution tank at this time], a large well with a flight of steps, which in Hindustan is called **wain.**

"This well was begun before the Char-bagh [a Persian-style garden, opposite where the Taj Mahal now stands]; they were busy digging it in the true Rains; it fell [in] several times and buried the hired workmen...

"It is a complete **wain,** *having a three-storeyed house in it. The lowest storey consists of three rooms, each of which opens on the descending steps, at intervals of three steps from one another. When the water is at its lowest, it is one step below the bottom chamber; when it rises in the Rains, it sometimes goes into the top storey. In the middle storey, a chamber has been excavated, which connects with the domed*



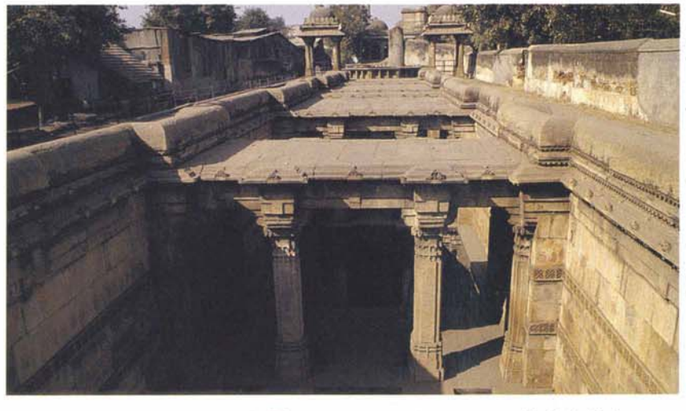
building in which the bullock turns the well-wheel. The top storey is a single room, reached from two sides by 5 or 6 steps which lead down to it from the enclosure overlooked from the well-head. Facing the right-hand way down, is the stone inscribed with the date of completion.

"At the side of this well is another, the bottom of which may be at half the depth of the first, and into which water comes from that first one when the bullock turns the wheel in the domed building afore-mentioned. This second well is also fitted with a wheel, by means of which water is carried along the rampart to the high-garden. A stone building stands at the mouth of the well and there is an outer mosque outside the enclosure in which the well is. The mosque is not well done; it is in the Hindustani fashion."

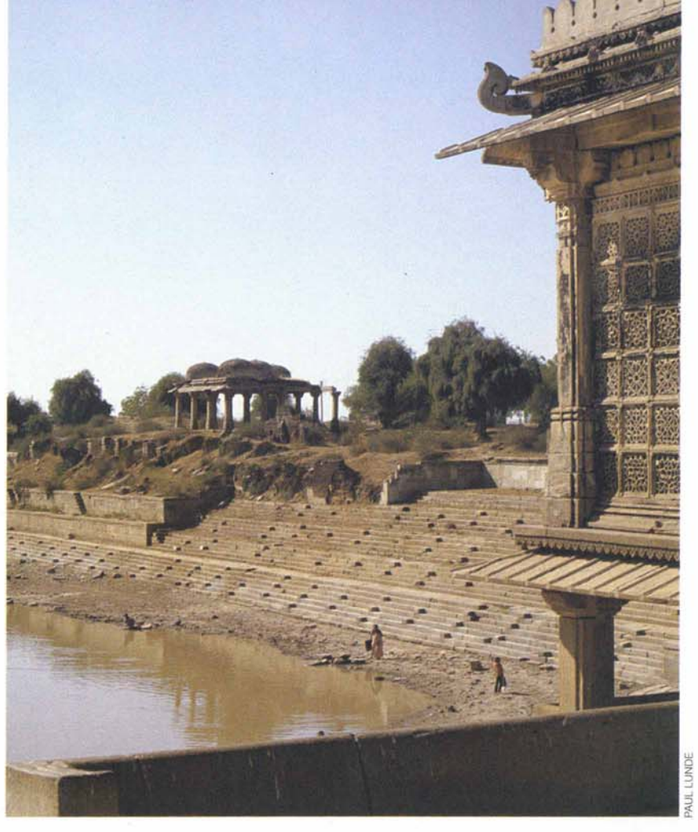
Thus wrote the Emperor Babur, founder of the Moghul dynasty. Leaving aside his mixed feelings about India – he was very homesick for Afghanistan – it is a good description of a *baoli*. Some are, as he describes, powered by a water wheel, while in others the water rises directly from a spring.

A classic example of a spring-fed well is the exceptionally beautiful Adalaj Vav, built in 1498 some 30 kilometers (20 miles) outside Ahmadabad in Gujarat state. Like the well described by Babur, Adalaj still stands in a charming garden, where passersby can rest while their animals enjoy the amenity of a cattle-trough provided for them across the road. The well is about 30 meters (100 feet) deep. Its five floors of galleries open on a central octagonal shaft, and its square columns are carved with delicate patterns almost entirely geometric, apart from lines of elephants – each in a different pose, and set at such a height that one imagines they were intend-

The excerpt from the writings of Babur was taken from *The Babur-Nama in English*, translated by Annette S. Beveridge, published in London in 1922 by Luzac.



The Dada Harir step-well, above, is now often bone-dry, but retains its fascination. At left, a local resident looks over a decorated wall at Dada Harir. At far left, boys from a nearby school stand atop Old Delhi's *Baoli*.



PAUL LUNDE

The large, man-made lake alongside the mosque at Sarkhej, above, features decorated sluices for irrigating local farmland.

ed to delight the children who now play up and down its steps. A carving of a lone fish decorates the wall of the secondary well. A common motif at Adalaj is the stylized sunflower that is so much a part of northwestern Indian art: One sees it everywhere, from the most archaic stonework to the modern country girl's skirt, from the designs clipped into a racing camel's coat to those worked in gold and precious stones for a Moghul ornament.

Baolis in general are remarkable for their functional elegance; they lack the ornamental exuberance of many Indian buildings. There are some notable exceptions, however, such as the Rani-ka-Vav, or Step-Well of the Queen, at Patan, a Gujarati city also famous for its sumptuous weaving.

Baolis are often part of a mosque complex, like the charming Dada Harir step-well, built with its mosque and garden in about 1499 by a lady at the court of Sultan Mahmud Shah, or Mahmud I Begra, of Gujarat. The lady, said to have been the nurse of the prince, built the complex as a *waqf* or religious charity at a cost of three lakhs of rupees (300,000 rupees). Simpler in decoration than the well at Adalaj, the Dada Harir well has dedicatory inscriptions in Arabic and Gujarati, just as Babur describes them.

No one can say for certain when the first *baoli* of this kind was constructed; there is no record of any before the second wave of Muslim conquest in the 12th century. Although the style is peculiar to the region, especially to Gujarat, a famous *baoli* of this type was built in Old Delhi by the Sultan Ala-ud-din Khilji (1296-1315). This step-well is still very much the social center of the busy popular quarter in which it stands, once again built close to a mosque, the Jamat Khana Masjid.

Baolis of various descriptions have been constructed by Muslim, Hindu and civil authorities, as and where needed, for nearly a thousand years. A Hindu prototype of the western-style Muslim *baoli* is the Mata Bhavani step-well, in Ahmadabad, believed to date from the 11th century. The most recent *baoli* on official record was constructed in the 1930's at Wankaner, in Gujarat.

Other types of water and irrigation systems are also associated with mosques in the Ahmadabad area. The original purpose of such systems was no doubt to provide pure water with which to perform the ablutions before prayer, but the wider benefit to the community at large must have been enormous.

A fine example is the beautiful mosque complex at Sarkhej, about 11 kilometers (seven miles) south of Ahmadabad, begun in 1445 by Mahmud Shah, the Gujarati sultan. A large lake was excavated along one side of the mosque; it was completed with finely designed and decorated sluices by Mahmud's son, Muzaffar Shah II, in 1514. The sluices provided the area with an excellent irrigation system, and the symbolism of the great mosque dispensing both religious enlightenment to a previously heathen population, and prosperity to a previously arid tract of land was certainly not lost on its builders.

Equally important as a reservoir is the Kankariya Lake in Ahmadabad itself, built by Sultan Qutb-ud-din Ahmad Shah of Gujarat (1451-8), who together with his mother was responsible for many of the Muslim monuments in the region. The lake is over a mile in circumference and the steps down to it, the sluices and a causeway to an island garden are all elegantly decorated. The Kankariya Lake was used by the Moghuls as a pleasure garden as well as a camp; today, it is a favorite spot for residents of Ahmadabad to stroll and escape the heat.

On a smaller scale, but still worthy of note, are the huge, vaulted underground reservoirs of certain mosques – sometimes as large as the mosque's courtyard itself – which were designed to provide water for the ablution tank. Good examples of these reservoirs can be found in the Dastur Khan mosque of 1463 and in the mosque of Shah Alam, built roughly a century later. Underground reservoirs were a standard feature of Gujarati mosques from earliest times; they later spread throughout Muslim India. The ablution tanks themselves are often of singular beauty in this part of India, and are usually set in gardens within the mosque compound. As with the step-wells, their waters serve not only to cleanse but to cool.

Caroline Stone, an occasional contributor to Aramco World, *lives in Seville and writes about Islamic arts and crafts.*

FIFTY YEARS PLUS A "CAN-DO" DECADE ...

SAUDI ARAMCO AT SIXTY

WRITTEN BY ARTHUR CLARK PHOTOGRAPHED BY S. M. AMIN

How can a company that's not quite five years old celebrate its 60th anniversary?

By inheriting a tradition, a reputation and a history too proud and too valuable to discard – and by building on that tradition.

Saudi Aramco, a company small only in years, was created by the government of Saudi Arabia in 1988, just five years ago this November, to continue the work of the Arabian American Oil Company (Aramco). Aramco, in which the Saudi government had been progressively acquiring an interest since the early 1970's, had been owned by the American oil majors Chevron, Texaco, Exxon and Mobil – and had ties to the petroleum industry in the Saudi kingdom that stretched right back to the beginning.

That beginning, in Saudi Arabia, was in 1933. That's when the Saudi government signed a concession agreement with the Standard Oil Company of California, predecessor of today's Chevron, opening up a large part of the young desert country for hydrocarbon exploration. In March 1938, following three years of frustrating drilling, the first commercially viable oil field was discovered at Dhahran (See *Aramco World*, May-June 1988). The kingdom and the company never looked back, in time joining the ranks of the world's greatest producers and exporters of oil and natural gas liquids.

So Saudi Aramco was born with a legacy that included a "can-do" attitude, an unmatched multinational work force, and a long list of achievements. The list included the first tanker shipment of crude oil from Saudi Arabia in 1939; in the mid-1940's, erection of the company's new refinery at Ras Tanura; in 1950, completion of the 1718-kilometer (1068-mile) Trans-Arabian Pipe Line linking the Eastern Province oil fields to the Mediterranean coast; and, in the 1970's, construction of Saudi Arabia's Master Gas System, a massive project which captured the gas wealth of the nation for use in industries at home and abroad (See *Aramco World*, May-June 1984).

The legacy is one the new company hasn't hesitated to enhance. In a remarkably short time, Saudi Aramco has developed from an oil enterprise focusing largely on production to one with operations extending around the world, and reaching vertically from the wellhead to the corner service station. The secret behind its long record of accomplishment is "the company's ability to accommodate ever-changing conditions and requirements," says Ali I. Naimi, Saudi Aramco president and chief executive officer. He calls the business's ability to meet tough challenges its "distinctive characteristic."

There are many milestones along the road to today's Saudi Aramco. To commemorate the first one – the May 29, 1933 signing of the concession accord – Saudi Aramco kicked off its diamond jubilee late last May with special issues of the company weeklies *The Arabian Sun* and *Qafilat al-Zayt (Oil Caravan)*. Other anniversary festivities have taken place, officially to mark 60 years of operation. But the focus is on the last decade, a period of tremendous expansion to become what today is the world's largest oil company.

That status was underlined in 1990 when nearly 4.6 million barrels per day of oil production vanished from world oil markets in the wake of the Gulf crisis and the subsequent international embargo on crude from Iraq and Kuwait. Between August and the end of that year, in a remarkable effort, Saudi Aramco was able to boost its output from 5.3 million barrels per day to 8.5 million barrels – a 62 percent increase – to help stabilize the market. Oil prices, which had ballooned to more than $40 a barrel, quickly retreated; an energy crunch was avoided that could have seriously harmed an already shaky world economy.

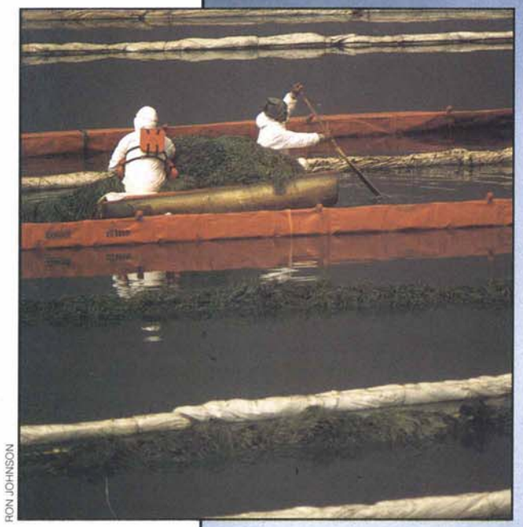
Last October, Saudi Arabia became the world's top oil-producing nation, eclipsing Russia, the number-one producer of the former Soviet Union. Saudi Aramco manages all but a tiny fraction of the production from the kingdom's fields, and is also the world's number-one exporter of crude oil and natural gas liquids.

Then, in June this year, the Saudi government entrusted Saudi Aramco with the functions of the kingdom's multibillion-dollar Saudi Arabian Marketing and Refining Company (Samarec), consolidating virtually all petroleum functions in Saudi Arabia – from exploration and production through refining, transportation and marketing. Saudi Aramco thus became responsible for all domestic refining, international product marketing and the distribution of petroleum products throughout Saudi Arabia. In July, the government extended the consolidation by also merging into Saudi Aramco most of the activities of the General Petroleum and Minerals Organization (Petromin), including Petromin's interests in the country's three joint-venture refineries. The decision to assign Saudi Aramco these tasks posed brand new challenges, said

1983 – King Fahd ibn 'Abd al-'Aziz visits Dhahran on company's 50th anniversary, inaugurates EXPEC.
– Ali I. Naimi appointed company president.
– First non-associated gas produced from Khuff zone.

1984 – Company takes over operation of East-West Crude Oil Pipeline.
– EXPEC's first supercomputer begins building reservoir-simulation models.

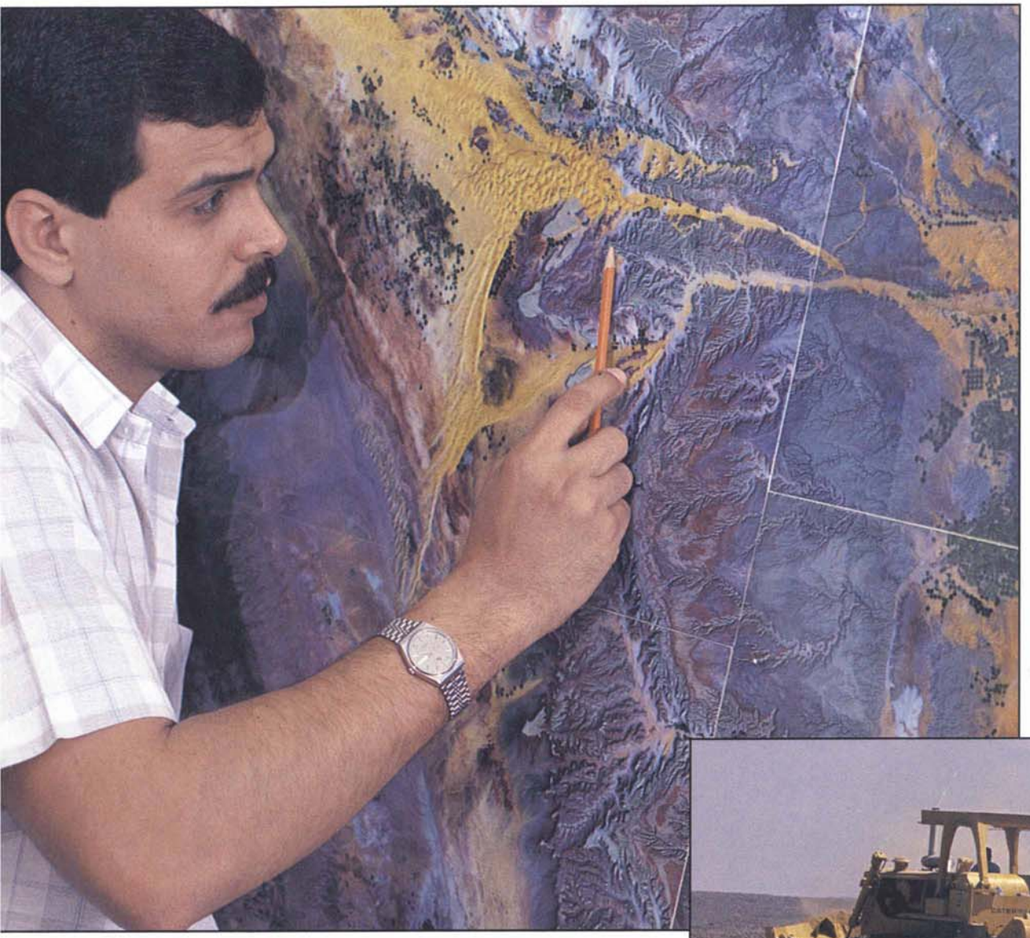
Opposite page: Watched by Minister of Petroleum and Mineral Resources Hisham Nazer, officials of Saudi Aramco affiliates and Texaco meet in London in 1988 to sign the agreement that launches the joint venture Star Enterprise. Previous spread: A product storage tank at the Berri Gas Plant, where associated gas is purified and a sweet, dry gas is extracted for use as an industrial fuel or feedstock.



RON JOHNSON

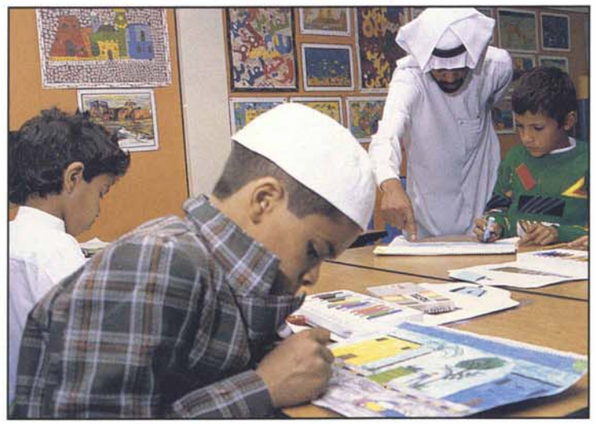
Above: More than 80 kilometers (50 miles) of barrier and sorbent booms were deployed in 1991 to protect Saudi Arabian coastal areas from a massive Gulf War oil spill. Right: Vacuum trucks, oil skimmers and 22 marine vessels contributed to the recovery of more than a million barrels of spilled oil.

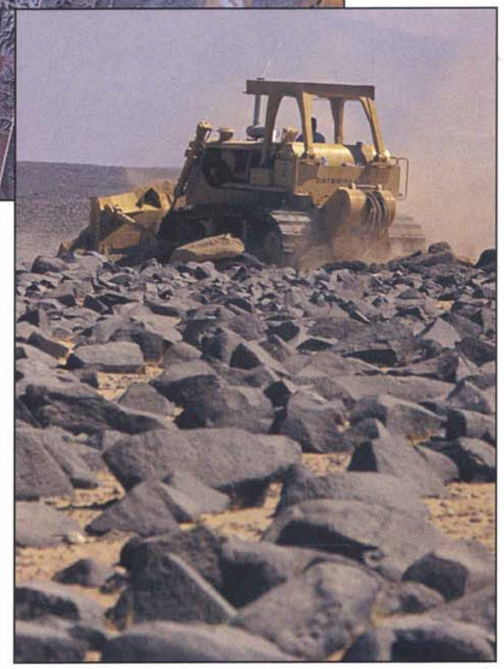
1985 – Work begins to increase East-West Crude Oil Pipeline capacity to 3.2 million barrels per day (bpd).
– Khuff non-associated gas capacity reaches 1 billion standard cubic feet per day (scfd).



Left: Images recorded by Landsat satellite 700 kilometers (435 miles) above the earth are computer-enhanced to allow geologists at EXPEC to identify structural anomalies on the surface that might point to hydrocarbon traps under the ground. Below: A bulldozer clears an area of harsh lava desert in northwestern Saudi Arabia for seismic exploration.

Below left: In one of the 92 schools built by Saudi Aramco and operated by the Saudi Arab government, brightly colored houses, trees and buses take form in an art class.
Opposite page: A Saudi operator works at the Shedgum Gas Plant, one of the three giant gas-processing plants in the kingdom's Master Gas System.





1986 – King Fahd inaugurates refinery modernization project, new training center in Ras Tanura.
– Government asks that exploration activities expand to limits of original concession area.
– First offshore three-dimensional seismic survey in kingdom.

Naimi, and "is yet another measure of the government's confidence in our company."

Two milestone events that took place just 10 years ago helped point the way to the giant oil enterprise of today. In May 1983, King Fahd ibn 'Abd al-'Aziz Al Saud inaugurated Aramco's Exploration and Petroleum Engineering Center (EXPEC), with its associated computer center and laboratories, in Dhahran. That November, Ali Naimi was appointed president of Aramco, becoming the first Saudi to hold the post.

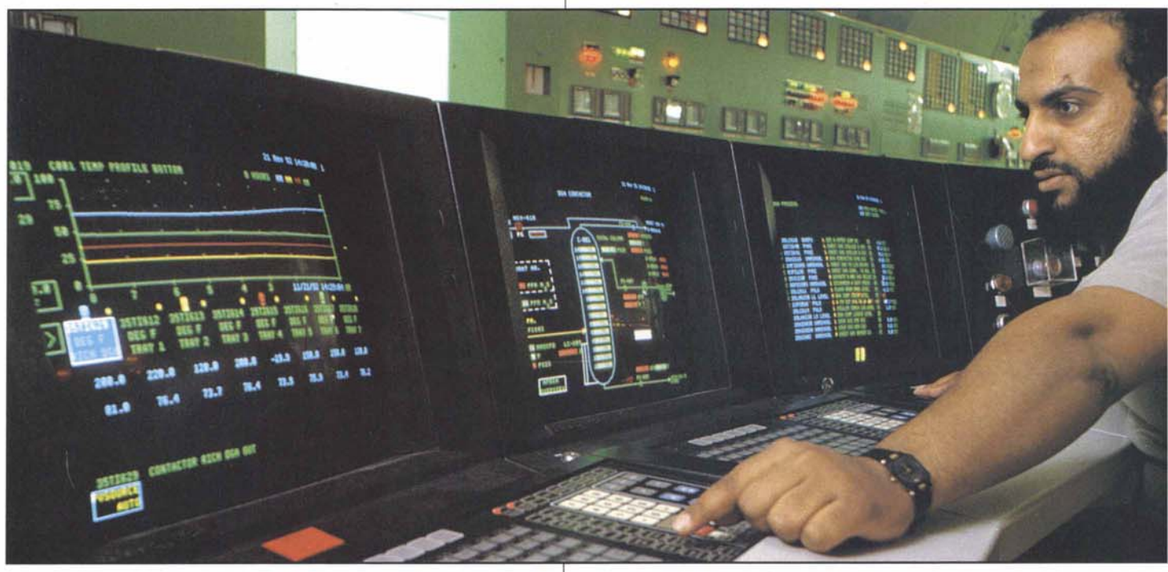
EXPEC linked top-of-the-line computer, exploration and petroleum-engineering facilities with expert manpower to create a world-class technical center whose primary purpose is to find and produce oil and gas with maximum efficiency. With the establishment of EXPEC, Saudi Aramco effectively declared its independence from such centers outside the country in the key fields of exploration and producing.

"EXPEC has become one of the largest upstream earth-science and engineering centers in the industry" in the last 10 years, says Sadad I. Husseini, Saudi Aramco's executive vice president of production operations. As a result, the company "has essentially eliminated its dependence on upstream technological support from other oil firms, and now provides technical expertise and special services in-house in all facets of engineering and producing operations."

It is through EXPEC that Saudi Aramco has introduced new technologies, such as advanced three-dimensional seismic surveying in 1986, which provides better data for exploration and field development, or, in 1991, horizontal drilling, to tap hard-to-get oil. EXPEC underscores the company's commitment to use the most modern computer technology to develop the kingdom's oil industry – and carries it out: The center's newest supercomputer, used to process seismic data, can carry out an astonishing 2.5 *billion* calculations per second.

The return on Saudi Aramco's continuing investment in EXPEC and its related facilities is impressive.

In the field of exploration, for example, Saudi Aramco has discovered hydrocarbons in central and northwestern Saudi Arabia and on the Red Sea coast – 10 new fields in all, and all since 1989. The Central Arabian strikes, now under development, include the discovery of super-light, low-sulfur crude equal to the world's finest known grades. The finds are the fruit of a kingdomwide exploration program which, between 1986 and 1990, saw the company's prospecting mandate grow more than six-fold to cover more than 1.3 million square kilometers (513,000 square miles) – an area almost as large as Germany, France and Spain combined, or the combined areas of Texas, Oklahoma, Kansas and Colorado.



Saudi Aramco manages more than 60 oil and gas fields, including the world's largest field, Ghawar, and the largest offshore field, Safaniya. At the end of 1992, recoverable crude oil reserves in the company's fields were 258.8 billion barrels. That quantity is not only about a quarter of the world's known total, it is also 6.4 billion barrels *above* the total in 1988, despite the production of some 10 billion barrels of crude in the intervening years – clearest proof of a successful exploration program. (Reserves of gas tallied 181.15 trillion standard cubic feet, compared with 177.29 trillion cubic feet five years before.)

EXPEC has also figured centrally in Saudi Aramco's campaign to boost crude production capacity to 10 million barrels per day to be able to meet anticipated world demand, a project begun in 1989. In another important effort involving EXPEC, the company carried out a success-

1987 – East-West Crude Oil Pipeline expansion project commissioned.
– Khuff gas capacity increased to 1.7 billion scfd.
– Aramco Exhibit, Dhahran Mosque open.

ful campaign in the mid-1980's to tap large amounts of "non-associated" gas – gas which could be produced independently of crude oil. This proved a valuable source of fuel gas for local industries and power generation at that time.

Of course, Saudi Aramco also transports and exports the hydrocarbons it produces. All together, the pipelines at the heart of its petroleum transportation system run about 11,700 kilometers (7266 miles), more than enough pipe to link Dhahran to Chicago. Saudi Aramco operates large port facilities on both the Arabian Gulf and the Red Sea coasts of the kingdom, and has paid particular attention in the last 10 years to developing the country's west coast as an export point.

In 1984, the company took over responsibility for running the East-West Crude Oil Pipeline, stretching 1200 kilometers (745 miles) from Abqaiq in the Eastern Province to Yanbu' on the Red Sea. Its capacity was then 1.85 million barrels a day. By 1987, the company had increased the capacity to 3.2 million barrels by building a parallel pipeline linked to the original line's 11 pump stations. This spring, Saudi Aramco boosted the line's capacity again, to a peak of five million barrels a day. The latest expansion included the addition of two "super-pumps" at each pump station, each pump driven by a turbine as powerful as that on a Boeing 747.

At Yanbu', Saudi Aramco hiked the capacity of the crude oil export terminal itself by 60 percent, to 4.2 million barrels per day. That job included construction of a fourth supertanker berth and a new control center, and erection of a 1.5-million-barrel crude-oil storage tank. The new tank, part of a 12.5-million-barrel tank farm, measures 125.5 meters (412 feet) around, and is the largest-diameter crude storage tank in the world.

While forging ahead with those concrete projects, Saudi Aramco has also continued the metamorphosis into an integrated international oil company that began in the mid-1980's. In 1984, the company formed subsidiaries to provide crude-oil tanker transportation services and to acquire oil-storage facilities abroad. In 1985, it began marketing crude directly to refining companies, rather than solely to the Saudi government's Petromin and the four Aramco partners.

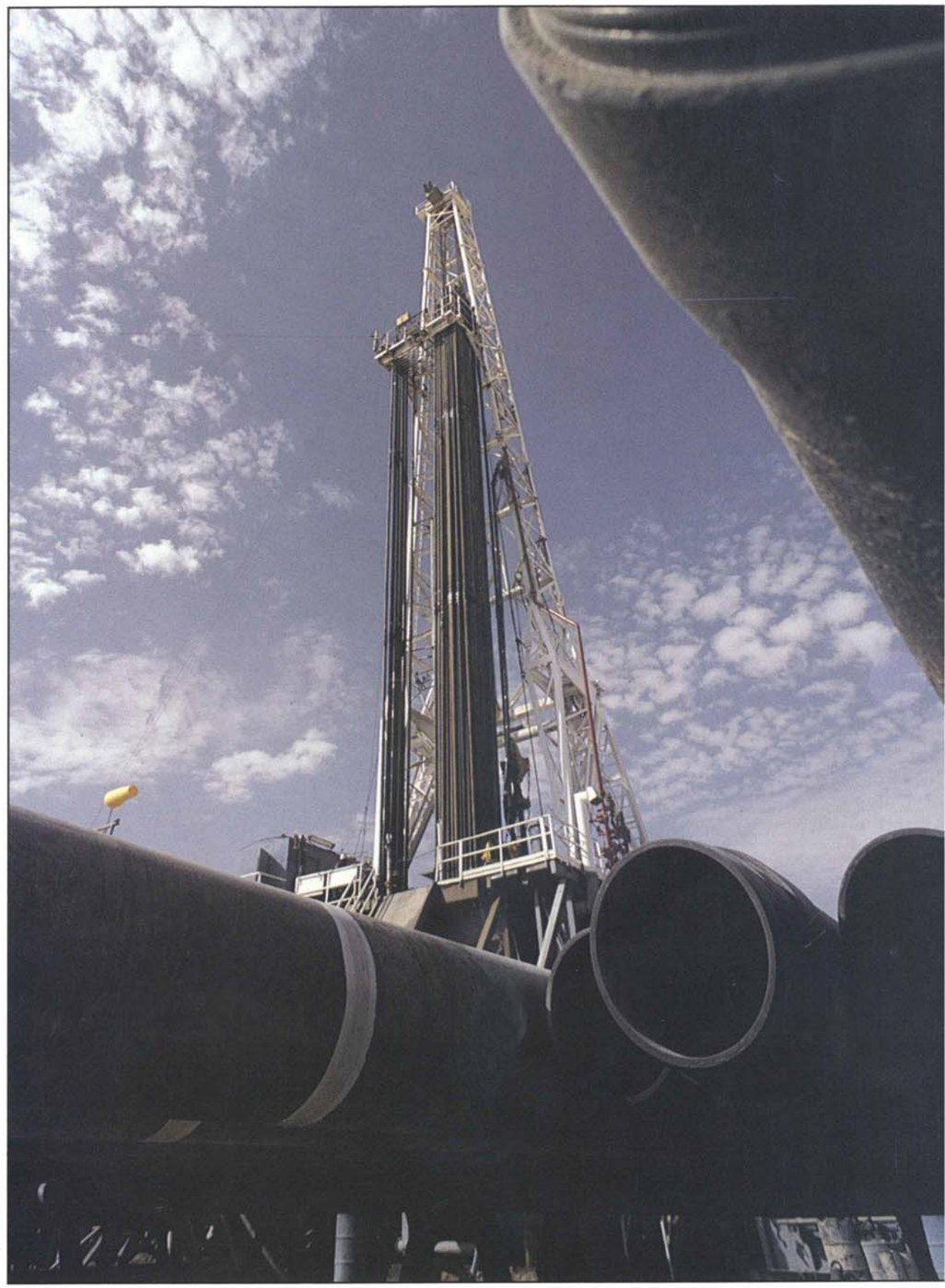
Today, Saudi Aramco has a global marketing organization with subsidiary offices in New York, London and Tokyo – and sells directly to more than 50 refiners worldwide. It owns a tanker fleet. And it has made big investments in refineries and product-distribution networks, including thousands of gasoline stations, in the United States and South Korea.

This "downstream" expansion effort aims to "protect and potentially increase the market share of Arabian crude, maximize the revenues from the sale of Arabian crude, and provide secure outlets through strategic alliances with refining companies in our major markets," says Abdallah Jum'ah, executive vice president of international operations.

Saudi Aramco's first international investment, a joint venture with a Texaco subsidiary in late 1988, created Star

1988
- Saudi Arabian Oil Company (Saudi Aramco) established.
- Joint-venture agreement with Texaco subsidiary creates Star Enterprise in U.S.
- Reserves in company-managed fields reach 252.4 billion barrels oil, 177.3 trillion scf of gas.

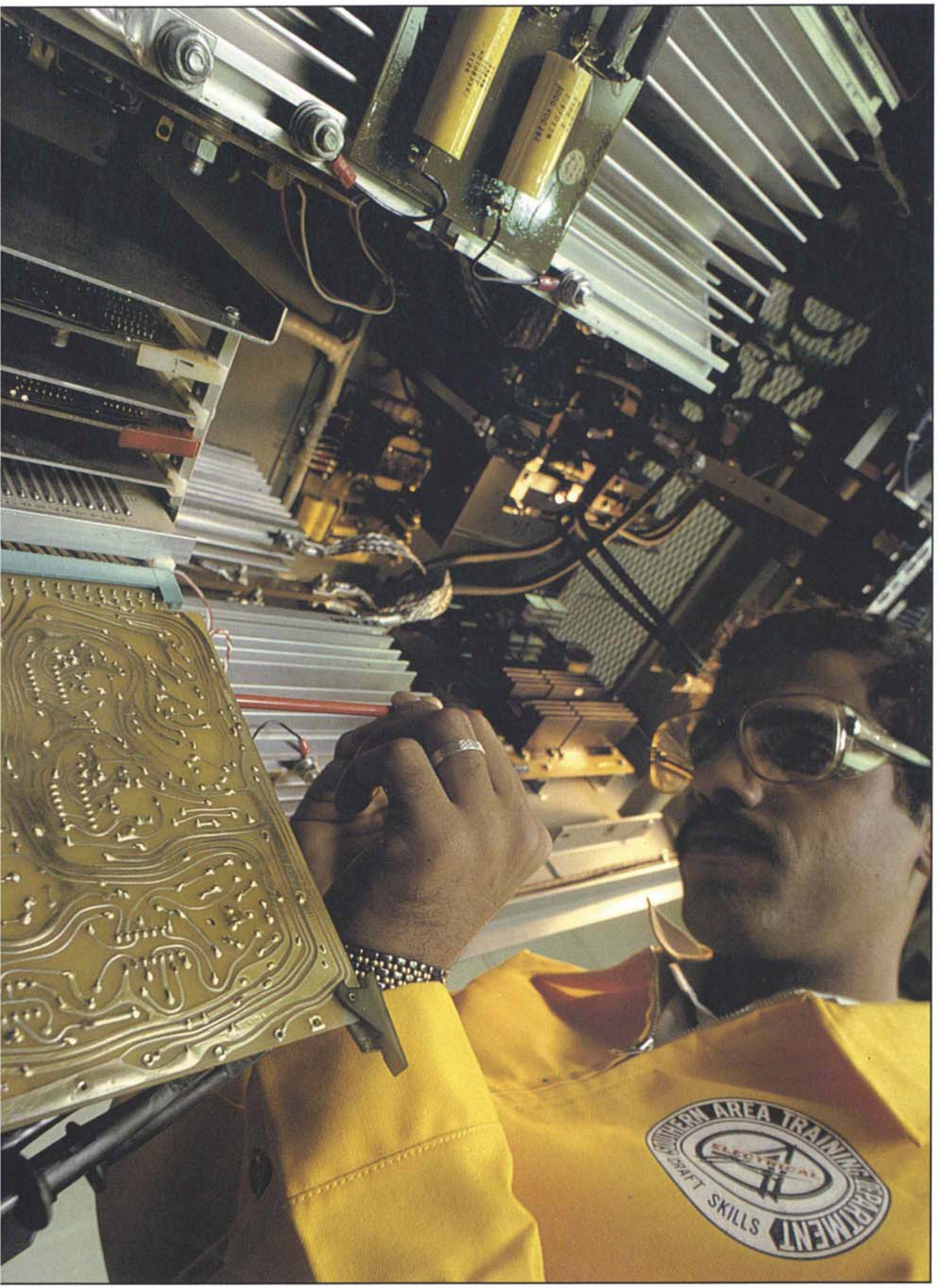
Opposite page: Dust rises from heavy equipment in the Hijaz Mountains as the capacity of the East-West Crude Oil Pipeline is increased to 3.2 million barrels per day. A further, later expansion increased the line's capacity to five million bpd.



Right: Special heavyweight piping is necessary to control high pressures encountered while drilling for non-associated gas in the Khuff formation.

1989
- First two hydrocarbon discoveries made in Central Province.
- Oil-spill contingency plan prepared.

1990
- Oil production boosted dramatically to stabilize world market.
- Five new discoveries made in Central Province.
- Exploration mandate extended to include Red Sea coastal plain, territorial waters.



Left: A trainee makes final adjustments to a circuit board in the Abqaiq Craft Skills Electrical Training Shop. Academic and job-skill training of its Saudi work force is one of the company's highest priorities.

Opposite page: A Saudi mechanical engineer, on a year-long assignment to a Pennsylvania turbo-machinery company as part of his career-development program, discusses a turbine with his American supervisor.

1991
- Company helps successfully combat Gulf oil spill.
- Subsidiary buys 35% of SsangYong Oil Refining of South Korea.
- Contracts signed for nine supertankers.
- First horizontal wells drilled in kingdom.

Enterprise – which became the sixth largest marketer of gasoline in the United States on its first day of operation, January 1, 1989. The deal gave Saudi Aramco, through a subsidiary, a 50-percent share in three major refineries and in a petroleum marketing network that covers all or part of 26 states from Maine to Texas, and the District of Columbia. Moreover, it provided the company with a guaranteed outlet for up to 600,000 barrels daily of Arabian crude oil.

Saudi Aramco looked east, to South Korea, for its second international tie-up: In July 1991 a subsidiary bought a 35-percent share of the SsangYong Oil Refining Company. SsangYong is South Korea's third largest petroleum refiner and its leading manufacturer of lubricants. This transaction gave Saudi Aramco an outlet for up to 325,000 barrels a day of crude, plus a refining and marketing stake in the fast-growing Pacific Rim region.

And Saudi Aramco is actively building on those investments. Last year, Star Enterprise completed an addition to its refinery in Port Arthur, Texas, that will increase the yield of high-value products, like gasoline and diesel fuel, obtained from heavier grades of crude. And work is under way to boost the production of high-value products at SsangYong's refinery in Onsan, South Korea. Meanwhile, Saudi Aramco is continuing to search in North America, Europe and the Far East for other profitable downstream investment opportunities in the industry.

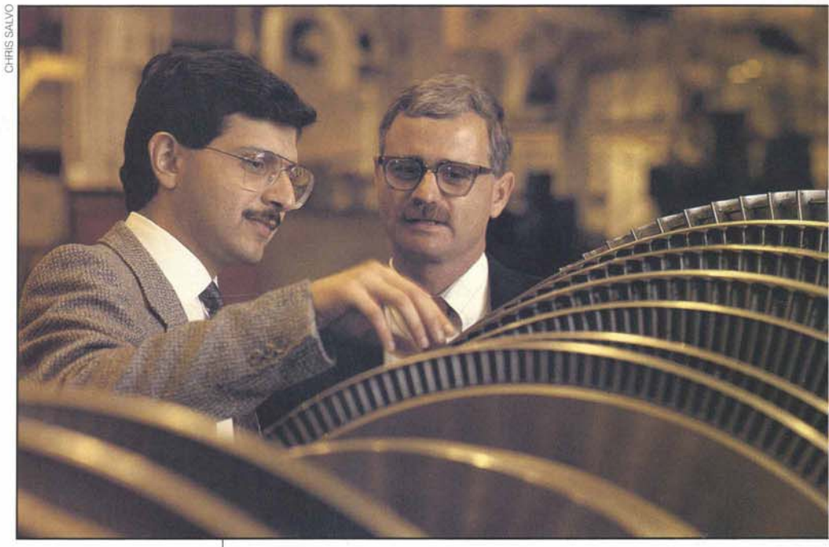
The company has also substantially increased its ability to deliver the crude it produces by acquiring supertankers of its own. The Saudi Aramco fleet, operated through a subsidiary named Vela International Marine, now stands at eight ships – up from four in 1988 – with 15 new vessels under construction. The first of the new supertankers is slated to be delivered late this year, and the last ones in 1995.

All this activity has also brought fundamental changes in the responsibilities of Saudi Aramco's finance organization, notes Nabil I. al-Bassam, executive vice president of finance. "Finance participates in downstream project evaluation and analysis," he says, "develops new risk-management and insurance programs, handles the receipt of funds worldwide, and tracks customer crude sales and the associated receivables."

If EXPEC marks Saudi Aramco's success in applying modern technology in upstream operations, and tankers and refineries around the globe highlight the company's bold new downstream dimension, then Ali Naimi himself represents the third factor in the Saudi Aramco equation – a training effort that's placed the direction and operation of the enterprise squarely in Saudi hands.

Naimi joined Aramco in 1947 at age 11 – in the pioneering days before the kingdom's labor laws regulated hiring ages – and climbed the ladder of professional development step by step through the company's training program. He is the most prominent among scores of company-trained Saudis now holding key posts with Saudi Aramco. In early 1988, at the same time Minister of Petroleum and Mineral Resources Hisham Nazer was named Aramco board chairman, Naimi, already company president, was named chief executive officer. When Saudi Aramco was founded that November, Nazer became its first board chairman and Naimi the first president and CEO.

The Saudi Aramco training program is one of the largest of its kind in the world, with a full-time training staff of nearly 1800. It dates back to the early days, when



CHRIS SALVO

Saudis learned the trade informally, working side-by-side with American oil men. The first formal industrial training programs were established in the 1950's; college-level training quickly followed. Currently, about 11,000 Saudi employees are undergoing vocational training or pursuing academic curricula, both inside and outside the kingdom (See *Aramco World*, March-April 1993).

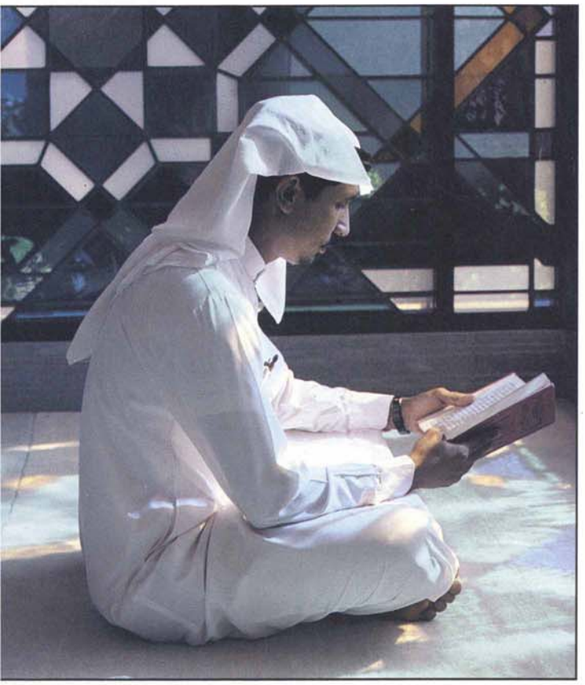
Thanks to this extensive and long-term training effort, Saudis now hold nearly all the company's senior management positions, and staff 66 percent of its supervisory posts. Equally critically, they comprise 98 percent of the company's key oil- and gas-facility operators.

Today, Saudi Aramco's work force of more than 46,000 is around 75 percent Saudi, compared with 50 percent a decade ago. Overall, staff is drawn from some 50 countries, giving the workplace a distinctly multinational flavor. There are around 5500 Asian, 3400 North

1992
- Oil, gas found at both ends of Red Sea coastal plain.
- Crude export capacity at Yanbu' terminal increased to 4.2 million bpd.
- Six more supertankers ordered.

American, 2100 European and 1000 non-Saudi Arab employees, many sharing their professional skills as mentors with a new up-and-coming generation of Saudis.

Abdelaziz M. al-Hokail, executive vice president of manufacturing operations, calls the company's



"Saudization" program a "major corporate direction ... pursued rationally and cautiously to ensure that all Saudi employees are expertly trained and can assume increasingly higher levels of responsibility as their experience grows." Expatriate employees, he says, "play an important role in the success of these efforts."

Saudi Aramco's international flavor carries over to its board of directors. The board includes seven Saudis drawn from the top ranks of the kingdom's oil, business and research sectors, and three Americans with decades of experience in the fields of international energy and banking.

As Saudi Aramco has grown, so has its emphasis on operational and environmental safety. In the environmental realm, the company's commitment to conduct operations so as to protect public health from the harmful pollution of land, air and water is long-standing. In 1991, in an operation lasting many months, Saudi Aramco acted with other Saudi government agencies to successfully protect vital industries along the Arabian Gulf shore when the largest oil spill in history entered Saudi Arabian waters as a result of the Gulf War. The company recovered more than a million barrels of oil, the most ever collected from a spill (See *Aramco World*, May-June 1991).

In its role as an international crude shipper, Saudi Aramco has established a Global Oil Spill Coordination Group to respond rapidly and effectively wherever the company operates to protect the environment in the event of a tanker spill. The company has carried out elaborate oil-spill exercises at home and abroad, while continuing extensive in-house environmental protection and monitoring programs.

The company has also remained an important force in the local community. The Home Ownership Program, under which Saudi Aramco provides free lots and subsidized home-construction loans for Saudi employees, began in 1952. Employees have built some 33,000 homes under the program, about half of them in the last decade. The company's School Construction Program, carried out in cooperation with the kingdom's educational authorities, has built 92 new schools for Saudi and other children in the area since 1953 – nearly a third of those in the last 10 years. Other landmark community construction in the last decade includes the Dhahran Mosque in the company headquarters area, and the nearby Saudi Aramco Exhibit (See *Aramco World*, November-December 1992).

Those buildings and programs, too, are important parts of the Saudi Aramco legacy – a legacy whose vitality was underlined late last year when representatives of Saudi Aramco, Texaco and Star Enterprise met in Port Arthur, Texas, to dedicate new facilities at the Star refinery there. The ties between Saudi Aramco and Texaco date back to 1937, when Texaco's predecessor, the Texas Company, joined in the Arabian oil venture, Minister of Petroleum Hisham Nazer told the gathering. That original link helped to build the oil industry in Saudi Arabia. Today, as Star Enterprise exemplifies, the building continues. "To succeed in the global economy," said Nazer, "we must continue, all of us, to cross new boundaries, both philosophical and geographical – some familiar, some difficult, all challenging."

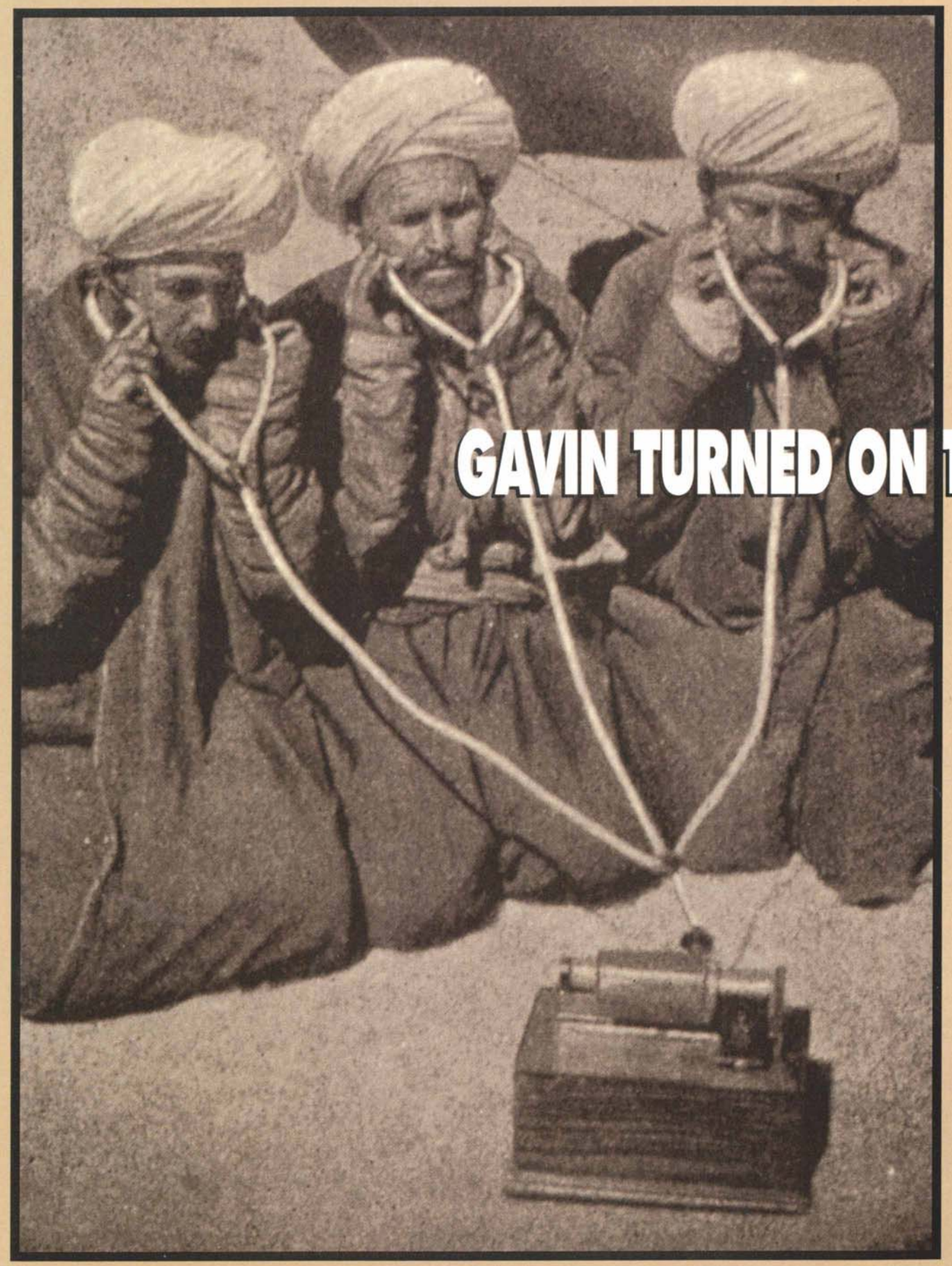
It would be hard to better sum up the reasons for Saudi Aramco's exceptional 60 years of success. ⊕

Arthur Clark, a Dhahran-based staff writer for Saudi Aramco, has recorded the company's development for the past 13 years.

1993
- Capacity of East-West Crude Oil Pipeline increased to 5 million bpd.
- Marjan field offshore complex, Tanajib onshore plant commissioned; capacity 600,000 bpd crude, 675 million scfd associated gas.
- Two gas-oil separator plants completed in Hawiyah field; capacity 600,000 bpd crude, 360 million scfd gas.
- Saudi Aramco takes over functions of Samarec, Petromin.

Opposite page, upper: The stained glass and gray granite of the Dhahran Mosque provide a peaceful place of prayer within the company's headquarters complex. Lower: The houses in this neigborhood of al-Dawhah in North Dhahran were built by Saudi Aramco employees through the Home Ownership Program.

Right: The kingdom's flag and the company's technological abilities together frame a bright future.



GAVIN TURNED ON THE TAPE RECORDER AND INVITED HIS LISTENERS TO STEP THROUGH A DOORWAY IN TIME

Three tribesmen, left, listen to their own recorded voices during the second Danish Pamir expedition, 1898-99. Photo from Through the Unknown Pamirs *by O. Olufson, London, 1904. Above, The Harvard Semitic Museum, where a 1970 bomb blast provided a fateful "moment of light." Engineer Franz Lechleitner, below, of the Phonogrammarchiv re-records and analyzes original wax cylinders.*

On a blustery winter day in December 1985, a small group of ethnomusicologists and scholars gathered at the Harvard Semitic Museum in Cambridge, Massachusetts, to journey back into the past. A hush fell over the room as Dr. Carney Gavin, curator of the museum, turned on a small tape recorder and invited his listeners to "envision a warmer climate, and step back through this doorway in time."

Crackles of static broke the silence, followed by the clear, haunting sound of an *'ud* an Arab stringed musical instrument and forerunner of the lute. Slowly, the *'ud* gave way to the vibrant drumbeat, swaying rhythms and festive music of a bridegroom's song in Arabic. As the music drew to a close, a man's voice reached out of the past and began to describe a trip he had taken on the Hijaz railroad to celebrate the opening of the Ma'an railway station – in 1907.

What captivated these listeners was not necessarily the quality of the music, which was somewhat amateurish. Rather, it was the fact that for the first time, they were hearing songs and melodies captured in the Arab world on wax cylinders over 80 years ago. The precursor of flat disk records, cylinders were used in the early 1900's to record sound on the original Edison phonographs. Today, Gavin believes these cylinders and the sounds they contain are "priceless time capsules ... important messages deliberately sent forth in time and space."

How these cylinders were discovered and subsequently restored over the past eight years is an intriguing detective story that itself crosses history and continents. As Gavin explains, it is a story with an explosive beginning.

On October 14, 1970, a bomb planted by anti-Vietnam War protesters in the Harvard Semitic Museum, which then also housed the Center for International Affairs, literally blew the roof off the building. Remarkably, the explosion resulted in a fateful "moment of light," as Gavin put it, uncovering more than 27,000 old photographs of the Middle East (See *Aramco World*, November-December 1983). The 19th-century photographs, known as the Bonfils Collection, had been acquired by the museum in the 1890's, stored neatly in boxes up in the attic, and forgotten for almost 80 years.

As a trained archeologist, Gavin was thrilled by the accidental discovery of the photographs. It is ironic, he noted, that "the two girls who planted the bomb opened up this whole world of early photos of the Middle East – the only region of the world where people avoided image-making." Gavin could not have guessed then that the photographic research initiated by the bomb blast would eventually lead them into the uncharted world of "phono-archeology."

Shortly after the collection was discovered, Gavin and his staff began the laborious and challenging task of identifying, cataloguing and preserving the photographs. A grant from King Fahd ibn 'Abd Al-'Aziz of Saudi Arabia in 1982 enabled the museum to complete this task and, in conjunction with the FOCUS project, to explore "extraordinary new fields" of photo research. An outgrowth of two international conferences, held at the museum in 1978 and 1981, the FOCUS project was given the task of "finding, organizing, copying, using and sharing" photographs important to the history of the Middle East.

This is where the story of the wax cylinders begins. Convinced that other historic photographs of the Middle East were hidden away, waiting to be discovered, Gavin and his staff began to cast their net out around the world. In 1983, photographs dating back to the late 1800's were rediscovered at the Oriental Institute in Leiden, Holland. The photographs had been taken by various consuls general of the Netherlands assigned to Jiddah during the late 1800's and early 1900's.

While documenting the collection in Leiden that summer for the KFA, Elizabeth Carella, curator of historic photographs at the Harvard Semitic Museum, recalled how they unearthed "a very exciting photograph, a small snapshot." In the picture, labeled "Jeddah February 20, 1909 – the Recording of Sayyid Mohammed," four white-suited men sit on thick carpets laid on a plank floor in the corner of an elegant

WRITTEN BY PINEY KESTING
PHOTOGRAPHS COURTESY OF THE HARVARD SEMITIC MUSEUM

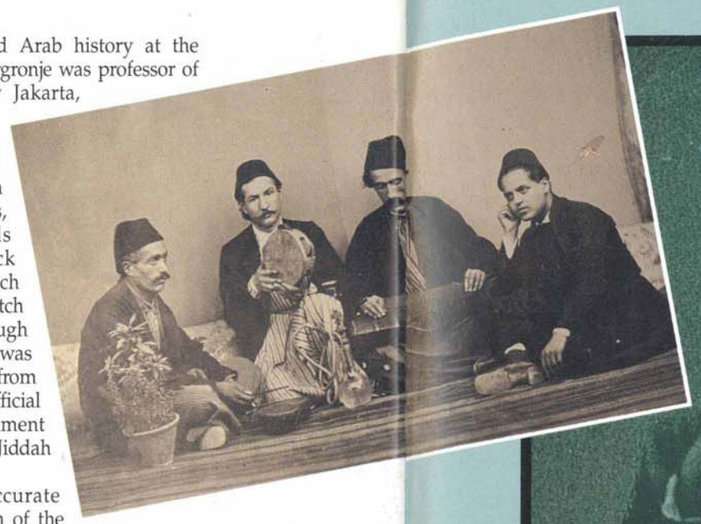
room. The pattern on the windowpanes identifies the room as a salon in the Dutch Legation in Jiddah. Placed in front of the group is an early Edison phonograph, the horn of which reaches up to the *'ud* being played by one of the men.

Astonished to find an Edison phonograph in use at such an early date in the Arabian Peninsula, Carella and her museum colleagues enlarged and carefully studied the photograph. Unwittingly, they had stumbled upon evidence that sound recordings were being made in the Middle East much earlier than scholars thought.

As the photograph of the recording session had been found in Leiden, Gavin and his staff thought the wax-cylinder recordings themselves could not be too far away. The search began. Returning to Leiden in 1984, they rummaged through the Oriental Institute's attics and storage rooms, and ultimately discovered 211 wax cylinders, some 150 of which contained the earliest sound recordings ever made in the Arabian Peninsula. The cylinders were stored in cardboard cases, with sparse annotations in Arabic, Dutch and Malay. Shortly thereafter, to their delight, the Harvard team also found an old Edison phonograph. William Corsetti, a designer at the museum, assembled a makeshift paper horn for the phonograph and they played one of the fragile wax cylinders. "For the first time," Carella recalls, "we were able to hear these voices from the past. It was a little bit like eavesdropping on history. We were hearing people celebrating, people at prayer, people playing music in the normal course of their everyday lives. It really was a very mysterious moment."

Just as the 27,000 photographs had been forgotten in the attic of the Harvard Semitic Museum, so had the cylinders been overlooked for more than 70 years. "The people who collected and stored these cylinders here would have been totally flabbergasted that their work was forgotten," Gavin observes. "They took the photographs and made the recordings because everything was changing."

In fact, Gavin theorizes that the cylinders found in Leiden may have been part of intelligence-gathering under the direction of the famous Dutch Islamist and colonial administrator Christiaan Snouck Hurgronje (1857-1936). In addition to teaching Arabic and Arab history at the University of Leiden, Snouck Hurgronje was professor of Arabic at Batavia, Java – now Jakarta, Indonesia. In 1870, the Dutch colonial government in Batavia recognized the importance of Jiddah as the gateway to Makkah for Indonesian Muslim pilgrims, and established a Netherlands Legation in Jiddah; Snouck Hurgronje was assigned to teach Arabic and Islamic culture to Dutch diplomats assigned there. Although the official purpose of the legation was to facilitate the flow of pilgrims from the Dutch Indies, another less official task was to observe and document the social and political climate in Jiddah and Makkah.



"I think the quest for accurate recording inspired the application of the Edison gramophone to the uncharted world of the Middle East," Gavin notes. Carella agrees: "It makes a lot of sense that the cylinders were a part of an ongoing process of observation. They certainly were utilized as raw data."

According to the original markings on the cylinders, they were shipped back to Leiden by the various consuls and their staff between 1907 and 1920. Stored in Snouck Hurgronje's personal archives, the cylinders were moved to the Oriental Institute when it was founded in 1927.

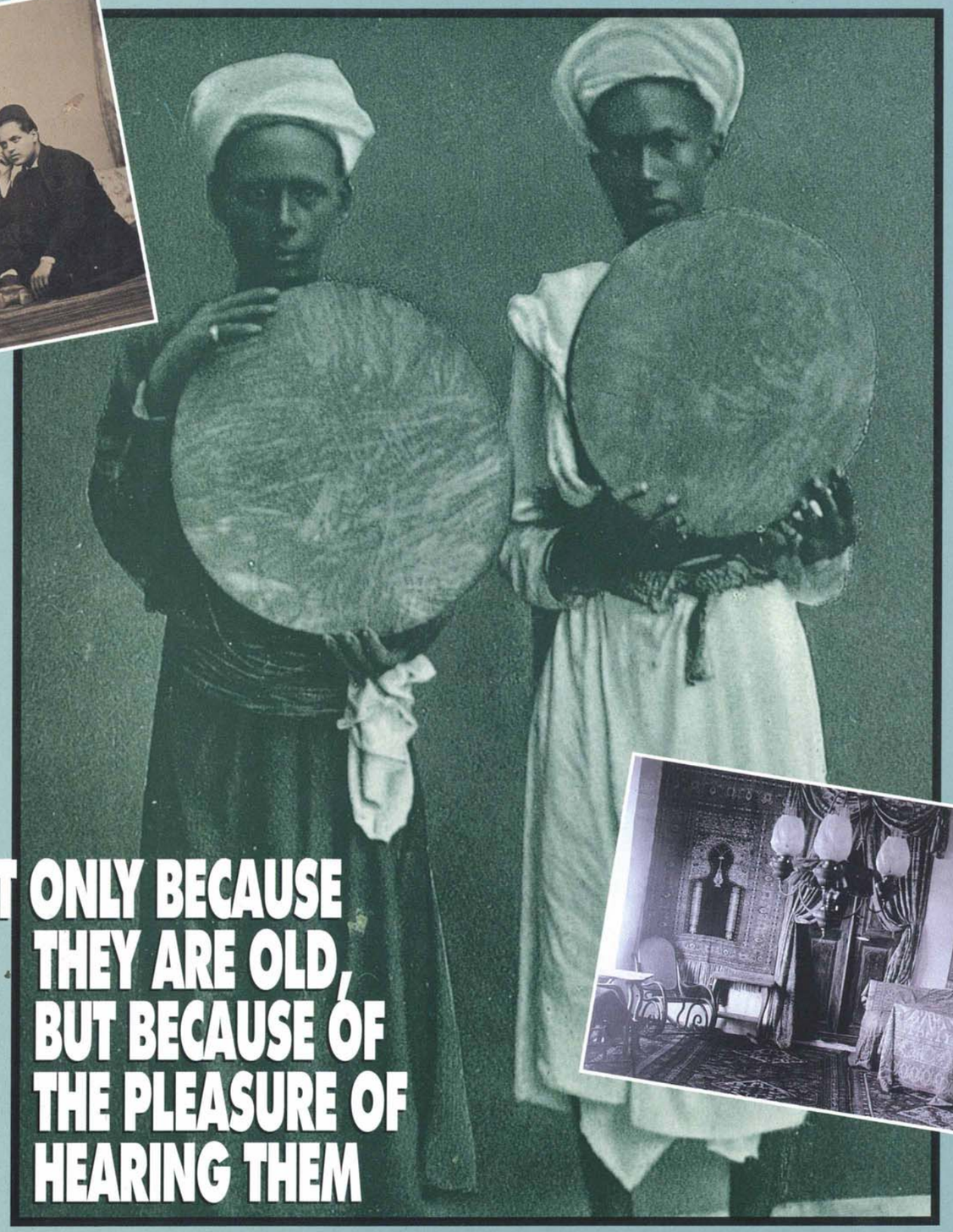
Once Gavin and his staff had discovered these unique "time capsules," their immediate task was to restore and preserve what was left of the wax cylinders. Decades of neglect had left mold on many of the fragile cylinders that threatened the quality of the recordings. In 1985, the cylinders were delivered into the hands of experts in the field – the Phonogrammarchiv, or Sound Recording Archive, of the Austrian Academy of Sciences. Founded in 1902 by Emperor Franz Josef, the Phonogrammarchiv began that same year to record Arab music systematically and preserve Semitic languages scientifically on cylinders.

Dr. Dietrich Schueller, director of the Phonogrammarchiv, and engineer Franz Lechleitner began the laborious process of restoring and electronically re-recording the Leiden cylinders onto tape. As Lechleitner explains, the cylinders' age and composition ruled out ultrasonic cleaning or liquid treatment of any kind. Most of the restoration work involved hand-cleaning – carefully brushing the mold off the individual cylinders. As a result, it often took several hours' work to be able to record just one minute of sound off an old cylinder.

While Schueller and his staff worked on restoring the cylinders in Vienna, Gavin began to investigate the history and importance of the sound recordings. "Gavin coined the term 'phono-archeology' because the cylinders were leading us toward discoveries that seemed to be revealing, historically and archeologically, components of a greater

An old Egyptian Baidaphon recording of Shaykh Muhammad Salim, left, is part of the collection at the Oriental Institute in Leiden. Far right: An interior view of the Dutch Legation in Jiddah, where the earliest Arabian sound recordings were made.

Arab musicians are portrayed above in an albumen photo from the Bonfils Collection, taken between 1867 and 1885. At right: Yemeni musicians bring their drums on the pilgrimage to Makkah, from Snouck Hurgronje's Bilder aus Mekkah.



THEY ARE VERY MOVING, NOT ONLY BECAUSE THEY ARE OLD, BUT BECAUSE OF THE PLEASURE OF HEARING THEM

THEY REACHED FOR THEIR INSTRUMENTS AND

Corsetti, Leiden's van Donzel and Raouf AbuJaber, honorary Dutch consul in Jordan, listen to a wax cylinder in 1984, left,. An original cylinder and its casing are displayed at right.

This snapshot of a 1909 recording session in Jiddah, left, led to the rediscovery of wax cylinders. At right, Harvard's Corsetti works with the cylinders in Leiden.

picture," Carella explains. "The entire process has been a wonderful detective story for us," she adds, noting that "all along the way there has been something new to discover."

The history of mechanically recording sound waves dates back to the mid-1800's. In 1857, two decades before the invention of the phonograph (and the year Snouck Hurgronje was born), French physicist Leon Scott had developed the "phonautograph." His invention visibly etched the patterns of sound waves onto thin metal foil. On December 8, 1877, Thomas Edison developed the phonograph, and one year later the first tinfoil cylinders were sold. Wax-cylinder phonographs were not developed until 1881.

In 1889, the year observed by the Phonogrammarchiv as the beginning of sound recordings for scientific purposes, the Edison phonograph became portable. Clues found in early documents and books reveal that the phonograph was being used in the Arab world before the 1900's. In 1890, Daniel Bliss, president of the American University of Beirut, demonstrated the use of a phonograph. Three years later, Harvard Professor Benjamin Ives Gilman traveled to the Chicago World's Fair, where on September 25, 1893, he recorded Arab and Indonesian music in the Turkish theater. Gilman's nine wax cylinders, two of which are in Arabic, are the first known acoustic recordings of Arabic made in the United States. Seven years later, at the Paris Exposition, 55 wax-cylinder recordings were made of performances by Berber, Zanzibari and Senegalese musicians.

ANSWERED THE TEACHERS OF THEIR TEACHERS

As Gavin dug deeper, his research grew "curiouser and curiouser, and more and more exciting." From the correspondence of Snouck Hurgronje, we know that he was recording speakers of Arabic and Indonesian on Java in Indonesia from as early as 1900 until 1906, when he returned to The Netherlands. Letters to colleagues back in Europe find him requesting information from the Vienna Phonogrammarchiv on the best way to preserve cylinder wax during his journey back to Leiden. In 1907, Snouck Hurgronje received over 100 cylinders of music, recorded for him by his faithful students, now diplomats, in Jiddah.

By the early 1900's, Arab musicians and singers were being recorded commercially on wax cylinders in the Arab world. Abdu al-Hamuli, a famous Cairene singer, was recorded before his death in 1901. Newspapers in Cairo advertised wax cylinder recordings of the "best singers" up to 1904.

Clearly, the cylinders found in Leiden, which now number over 700, constitute one of the largest and most varied collections of Arabic language and music recorded in the Arab world. Although the Phonogrammarchiv made the first formal recording of an Arabic singer, a Dofari from Oman, at its Vienna institute in 1902, the Leiden cylinders are the earliest known sound recordings of Arabian voices made in the Arabian Peninsula.

Discovery of the cylinders has not only uncovered forgotten bits of music and language, but has also awakened long-dormant memories among listeners. Gavin recalls visiting Saudi Arabia with tapes of some of the restored cylinder music. When he played the tapes for traditional musicians from Makkah, "their reaction was unbelievable," he says. "They reached for their instruments and answered the teachers of their teachers." Older musicians, he adds, have listened to the music and recognized the same words sung today, albeit to different tunes.

Another listener recalled his grandmother telling him how the family sent a supply of pure beeswax to Aden at the turn of the century to "capture the melodies of musicians." Gavin's research has convinced him that the wax-cylinder phonograph was used more widely than originally thought. In fact, he notes, the Arabic word for "gramophone record" is *ustuwanah*,which literally means "cylinder."

The Leiden collection represents, in Gavin's opinion, "international sound archives" compiled from the early 1900's to approximately 1920. "Very specific people were being recorded, very specific [music] numbers were being recorded and they were looking for genres. This is really astonishing for that time period."

Gavin emphasizes that the people making the recordings in the early 1900's were true pioneers in the field. "I would love to be a great discoverer," he confesses, "but I am really not. We have been fortunate enough to tune in to messages that were very deliberately sent out into time and space by people who went to a lot of trouble to do that." The sound recordings, he adds, were "made at great expense, captured with fragile equipment and brought back."

Over the past eight years, restoration and re-recording of the cylinders have revealed just how vast and unique the collection is.

"We have recordings of ladies of the Tihamah, who are hired today for weddings to greet the bridegroom," Gavin explains. "We have the Bedouin from the Wadi Maghreb, and we have very sophisticated madrigal- or sonnet-like *qasa'id* [odes] from Makkah. Because Makkah was the convergent center for pilgrims from all over the world, many of whom lived there for a long time, we have recordings from various lands."

IT WAS A BIT LIKE EAVES DROPPING ON HISTORY

The cylinders contain rare musical performances of every sort: *adhans* (calls to prayer), wedding songs, cantillations of the Qur'an, traditional poems, individual compositions and festive choral performances by groups of men or women, as well as a wide variety of instrumental pieces for traditional reed and stringed instruments.

Since most of the cylinders were recorded by the Dutch Legation in Jiddah – a city known historically as a crossroads for trade and pilgrimage – they also embrace a broad geographical spread of dialects and languages. Yemeni, Hadrami, Zanzibari, as well as Hijazi, Indonesian and Sudanese speakers of Arabic have been identified on the cylinders. Given the variety of voices and melodies recorded, the cylinders represent the first comprehensive corpus of Arabic speech and music.

Dr. Emeri van Donzel, director of the Oriental Institute in Leiden, believes that the cylinders will be very useful for "scholars of the Hijazi dialect and music. They are very moving, not only because they are old, but because of the pleasure of hearing them. The cylinders

can help to develop interest in the West in the traditional Hijazi language and music, as well as in the social background which scholars will discover behind these recordings."

In addition to melodies from the past, the cylinders contain the first known recordings of public announcements and travelogues. On one cylinder, the voice of a town crier announces the departure of ships from the port of Jiddah. Another recording explains how refuse "is to be picked up before dawn by the municipality's employees from the entrance of each building where pilgrims are housed."

Elizabeth Carella is intrigued by the travelogues preserved on cylinders. "To think that a person in the early part of the century would have the foresight to record those impressions is just fascinating." Having discovered both the photos of and the commentary on these journeys "provides a wonderful context historically."

History is indeed captured on the cylinders. One travel report tells the story of an exciting journey made in 1907, to attend the grand opening of the Ma'an railway station. Ma'an, today in Jordan, was a settlement on the fringe of the desert, where pilgrimage caravans gathered before journeying on to Makkah. After traveling from Makkah to Jiddah, the 'reporter" related that "we traveled to Suez by an Egyptian steamer and stayed there six hours. We then took the railroad to Port Sa'id. From Port Sa'id, we traveled to Beirut by Egyptian steamer and stayed there one day, and then on to Damascus.... Then from Damascus, we took the railroad to Ma'an for three days and stayed there one day. It was the best of days.... Insha'allah [God willing], this year I will take this same route to Madinah and stay there for a month.... May God let us meet again in happiness, and may God's safety be with you."

This is the first known broadcast about travel in Jordan, and other travelogues contain seafarer's reports of journeys from Jiddah via Aden to Bombay, Calcutta and on to Rangoon.

Apart from the vast collection of Arab music and Arabic language captured on the cylinders, the songs and speech of several Indonesian languages, such as Gayo, Acehnese, Imperial Malay and Sundanese, have been recorded. Dr. Philip Yampolsky, an ethnomusicologist specializing in Indonesian languages, believes the cylinders contain some of the earliest documentation of Indonesian music.

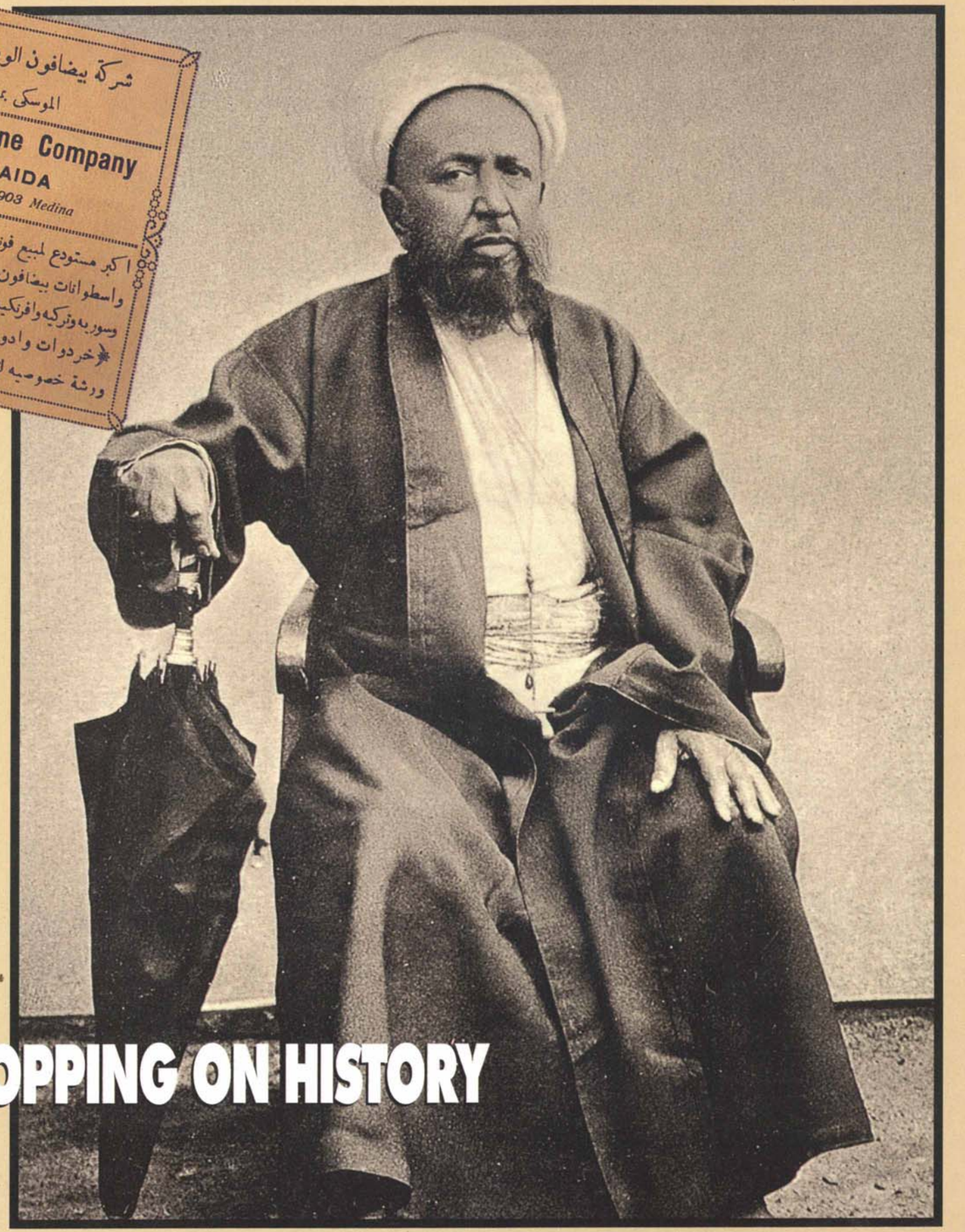
When a small portion of the re-recorded cylinders was played for the first time on that cold December day in 1985, the response was one of astonishment. Professor Nicholas M. England, former dean of the School of Music at the California Institute of Arts, commented: "On the strength of what I have heard, this is an amazingly preserved sound from the past, which we had rather given up hope of ever capturing." It is, he added, "a simply stunning discovery."

After decades of neglect and six years of painstaking restoration and re-recording, a sampling of these early Arabian recordings will be released on compact disc in 1994 in a joint venture among the Harvard Semitic Museum, the Oriental Institute in Leiden and the Phonogrammarchiv in Vienna.

But the story doesn't end here. "The discovery of this early Arabian music is just the tip of an iceberg," Gavin asserts. He and his colleagues are convinced that other forgotten cylinders lie hidden in attics and closets around the world. If one intriguing photograph, uncovered in a dusty attic in Leiden, could unlock the forgotten and fascinating world of early Arabian sound recordings, the discovery of additional cylinders may open other important windows to the past. ⊕

Piney Kesting is a frequent contributor to Aramco World *from her base in Boston.*

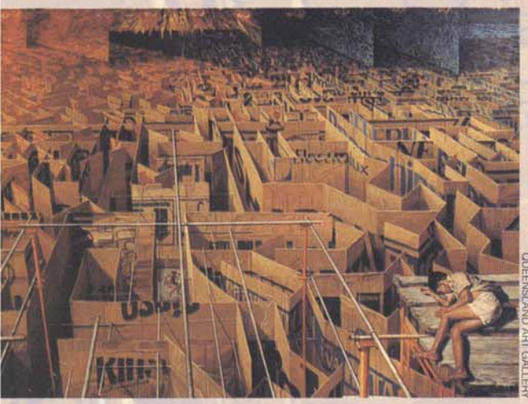
Baidaphon, described in a bilingual label above, produced early Arabic recordings. At left: Gavin, on the left, confers in Leiden with Saudi Ambassador Zaynal Dabbagh and van Donzel.



At right: A Makkan physician who aided Snouck Hurgronje.

Inside back cover: A woman with an 'ud, photographed by Bonfils in the 1870's.

EVENTS & EXHIBITIONS



"Labyrinth" (1990) by Indonesia's Dede Eri Supria.

QUEENSLAND ART GALLERY

Asia-Pacific Triennial of Contemporary Art. Art and artists from 12 countries and Hong Kong are featured in the first major exhibition to link the contemporary art of Australia, Asia and the Pacific. The first of three such events this decade, the Triennial is billed as an effort to challenge stereotypes and promote cultural understanding between Australia and its Asian and Pacific neighbors. Some 200 works are being presented in media such as painting, sculpture, printmaking, photography, performance and installation art. Never before has contemporary Asian art been exhibited alongside the art of Australia and the Pacific, specifically Polynesian (Maori and Samoan from New Zealand), Melanesian (from Papua New Guinea) and Aboriginal Australian art. Asian countries with substantial Muslim populations are among those featured, including Indonesia, Malaysia, China, the Philippines and Singapore. Islamic revivalism in Indonesia and Malaysia is one of the many themes being explored. Indonesian contributions range from the powerful Islamic abstraction art of A.D. Pirous to the intense, realistic urban imagery of Dede Eri Supria. Queensland Art Gallery, **South Brisbane, Australia,** from September 18 through December 5, 1993.

Digging in Jordan: *British Museum Excavations at Tell es-Sa'idiyeh.* This site, thought to be the ancient city of Zaretan, was occupied from the early Bronze Age through about 700 BC. British Museum, **London,** September 15, 1993, through March 13, 1994.

Images of a Lifetime: *Photography by Reno Wideson.* Unique and historically valuable color photos of Cyprus, taken over 42 years, trace the paths of numerous journeys throughout the island in all seasons. Commonwealth Institute, **London,** September 17 through October 13, 1993.

Egyptian Blues. Pharaonic-period ceramics, painted blue-green, capture the magic and mystery of ancient Egypt. Musée d'Art et d'Histoire, **Geneva, Switzerland**, through September 19, 1993.

L.A. Festival: *Home, Place and Memory.* The triennial urban festival focuses this year on African, African-American and Middle Eastern culture and the arts, with work by visiting and local Arab and Arab-American artists, in such areas as music, theater, puppetry, film, video and poetry. **Los Angeles,** through September 19, 1993. For information, phone (800) 652-3378.

Teaching About the Arab World and Islam is the theme of teacher workshops cosponsored by the Middle East Policy Council in Washington, D.C., and conducted by AWAIR, Arab World And Islamic Resources and School Services in Berkeley, California. Confirmed sites and dates include: North Salem High School, **Salem, Oregon,** September 25; Central Missouri State University, **Warrensburg,** October 1; **Midland [Texas]** Independent School District, October 2; Santa Clara County/Education, **San Jose, California,** October 18; 12 Districts - Mendocino County, **Ukiah, California,** October 21; University of **Kentucky, Lexington**, October 23; San Bernardino/Riverside Counties, **San Bernardino, California,** October 28; Fayetteville-Manlius High School, **Fayetteville, New York,** October 30; Unified School District, **San Diego, California,** November 2; **Youngstown [Ohio]** State University, November 5; Kenmoor Middle School, **Landover, Maryland,** December 2. For details, call (202) 296-6767 or (510) 704-0517.

The Persians. The powerful themes of betrayal and family tragedy in Aeschylus's classic play are revisited by director Peter Sellars and poet Robert Auletta in the context of the recent Gulf War, amid a haunting soundscape created by Nubian musician Hamza El Din. Mark Taper Forum, **Los Angeles,** September 26 through October 24, 1993.

Ancient Egypt: *A Moment of Eternity.* Some 400 objects and artworks are featured in what has been called the most important exhibition of ancient Egyptian art to be held in Scandinavia. **Tampere [Finland]** Art Museum, September 30, 1993, through January 2, 1994.

Beyond the Java Sea: *Art of Indonesia's Outer Islands* explores the cultural life and thought of this Muslim nation's Outer Islands peoples, as expressed through their traditional arts. Queensland Museum, **South Brisbane, Australia,** through September 30, 1993.

Roots of Conflict. This annual conference of the Middle East Institute features panels of regional experts discussing economic issues, the Mideast peace process, ethnic conflicts and the future of Iran. Middle East Institute, **Washington, D.C.,** September 30 through October 1, 1993. For details, phone (202) 785-1141.

The George Ortiz Collection – Antiquities: *Ur to Byzantium.* For the first time, the public has an opportunity to view the vast range of this famous private collection. Ny Carlsberg Glyptotek, **Copenhagen,** October 1 through December 31, 1993.

The Musical World of Islam. This festival, with concerts at New York City locations, gives American audiences a sampling of the different Islamic musical traditions. Partial schedule: Abida Parween (Pakistan), October 2; Dimi Mint Abba (Mauritania), October 3; Sabah Fakhri (Syria), October 9; Meral Ugurlu (Turkey), October 16; Ilyas Malayev Ensemble (Bukhara), November 6; Nusrat Fateh Ali Khan & Ensemble (Pakistan), November 14; Persian Traditional Music Ensemble With Mojaba Khoshzamir (Persia), November 20; Simon Shaheen with the Near Eastern Music Ensemble and Others, December 4; Gnawa and Berber Music With Hassan Hakmoun (Morocco), January 15, 1994; Cinucen Tanrikorur (Turkey), January 22; Ali Jihad Racy and Mansour Ajami (Lebanon), February 25; Hamza El Din (Sudan), March 4; and Alem Kassimov Trio (Azerbaijan), March 11. World Music Institute, **New York.** For information, call (212) 545-7536.

Visiones del Pueblo: *The Folk Art of Latin America.* This traveling exhibition illustrates the European, African, Asian and indigenous roots of Latin American folk art traditions, including the role of Islamic Spain. Corcoran Gallery of Art, **Washington, D.C.,** through October 10, 1993; Natural History Museum of Los Angeles County, **Los Angeles,** November 1, 1993, through January 5, 1994.

Kaleidoscope of Kurdish Rugs. The 17th rug convention of the Textile Museum focuses on the weavings of Kurdistan. Textile Museum, **Washington, D.C.,** October 15 through 17, 1993.

The Munayyer Collection of antique Palestinian and Syrian costumes is touring public libraries in New Jersey. Remaining schedule: **Plainsboro** public library, November-December 1993.

From India's Hills and Plains: *Rajput Paintings From the Punjab and Rajasthan.* Some 30 pictures painted for Rajput princes depict courtly activities and religious themes in brilliant – sometimes smoldering – colors. Harvard University's Arthur M. Sackler Museum, **Cambridge, Massachusetts,** through November 7, 1993.

Middle East Studies Association's 27th Annual Meeting. More than 100 panels will discuss various regional topics. Also of interest will be a film festival, book exhibit and promotional booths. **Research Triangle Park, North Carolina,** November 11 through 14, 1993. For details, phone (602) 621-5850.

From Khorsabad to Paris: *The Discovery of the Assyrians.* This display of Assyrian antiquities marks the 150th anniversary of the first archeological excavations in Mesopotamia, begun by the French at Khorsabad, Iraq, in 1843. Musée du Louvre, **Paris,** November 18, 1993, through February 14, 1994.

Brooklyn Museum's Egyptian Reinstallation. One of the world's finest collections of Egyptian artifacts will be reinstalled as the third floor of the museum's West Wing reopens. A major series of Egyptian motion pictures, including films by Yousef Chahine, will be held in conjunction with the reinstallation. **Brooklyn [New York]** Museum, from December 3, 1993.

Mediated Images: *Asian Identity in Contemporary Art* explores the visual art of 15 immigrant and expatriate Asians "whose work actively mediates their joint identities as Asians and Americans." The artists are of Chinese, Japanese, Korean, Filipino, Southeast Asian and Indian backgrounds. The Asia Society, **New York,** January 1 through June 30, 1994.

The Divine Word of Islam. Bound manuscripts of the Qur'an, books of prayer, folios from dispersed volumes and a ceramic tombstone are the key elements of this exhibition. Arthur M. Sackler Gallery, Smithsonian Institution, **Washington, D.C.,** through January 2, 1994.

Thundering Hooves: *Five Centuries of Horse Power in the American West.* This show highlights the vital role of the horse-and-rider in the settlement of the Hispanic Southwest. Much was derived from the horsemanship traditions of Muslim Spain. National Cowboy Hall of Fame, **Oklahoma City,** through January 2, 1994; **Fort Worth [Texas]** Museum of Science and History, February 5 through May 1, 1994.

Egyptomania: *The Influence of Egyptian Art From 1750 to 1930.* This exhibit draws on works from the Louvre and various other French museums. Musée du Louvre, **Paris,** January 18 through April 18, 1994.

A Treasury of Indian Miniatures. Forty recently acquired works, including Moghul, Rajasthani, Pahari and Company paintings, will go on display to inaugurate a new museum wing. Museum of Arts and Sciences, **Daytona Beach, Florida,** January 22 through May 30, 1994.

Indian Miniatures. Some 77 paintings and 15 works on paper, dating from the 15th through 19th centuries, cover horticulture, the palace, religion and portraiture. **Brooklyn [New York]** Museum, February 4 through May 1, 1994.

From Hannibal to St. Augustine: *Ancient Art of North Africa From the Musée du Louvre.* Marble sculptures, mosaics, jewelry, vases and other artworks illustrate the history of North Africa from the Punic settlements of the third century BC through the early Christian period. Emory University's Michael C. Carlos Museum, **Atlanta,** February 21 through May 29, 1994.

Photographs by Wilfred Thesiger: *A "Most Cherished Possession."* The great explorer and writer is honored with an exhibition of some of his best photos from Arabia, southern Iraq and other countries of the region. Oxford University's Pitt Rivers Museum, **Oxford, England,** June 18, 1993, through February 27, 1994.

The Saudi Aramco Exhibit. Centered on the Arab-Islamic technical heritage, this permanent interactive, "learn-by-doing" scientific exhibit relates the historical background to today's petroleum exploration, production and transportation. **Dhahran, Saudi Arabia.**

Information is correct at press time, but please reconfirm dates and times before traveling. Readers are welcome to submit information for possible inclusion in this listing.

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