ARAMCO WORLD

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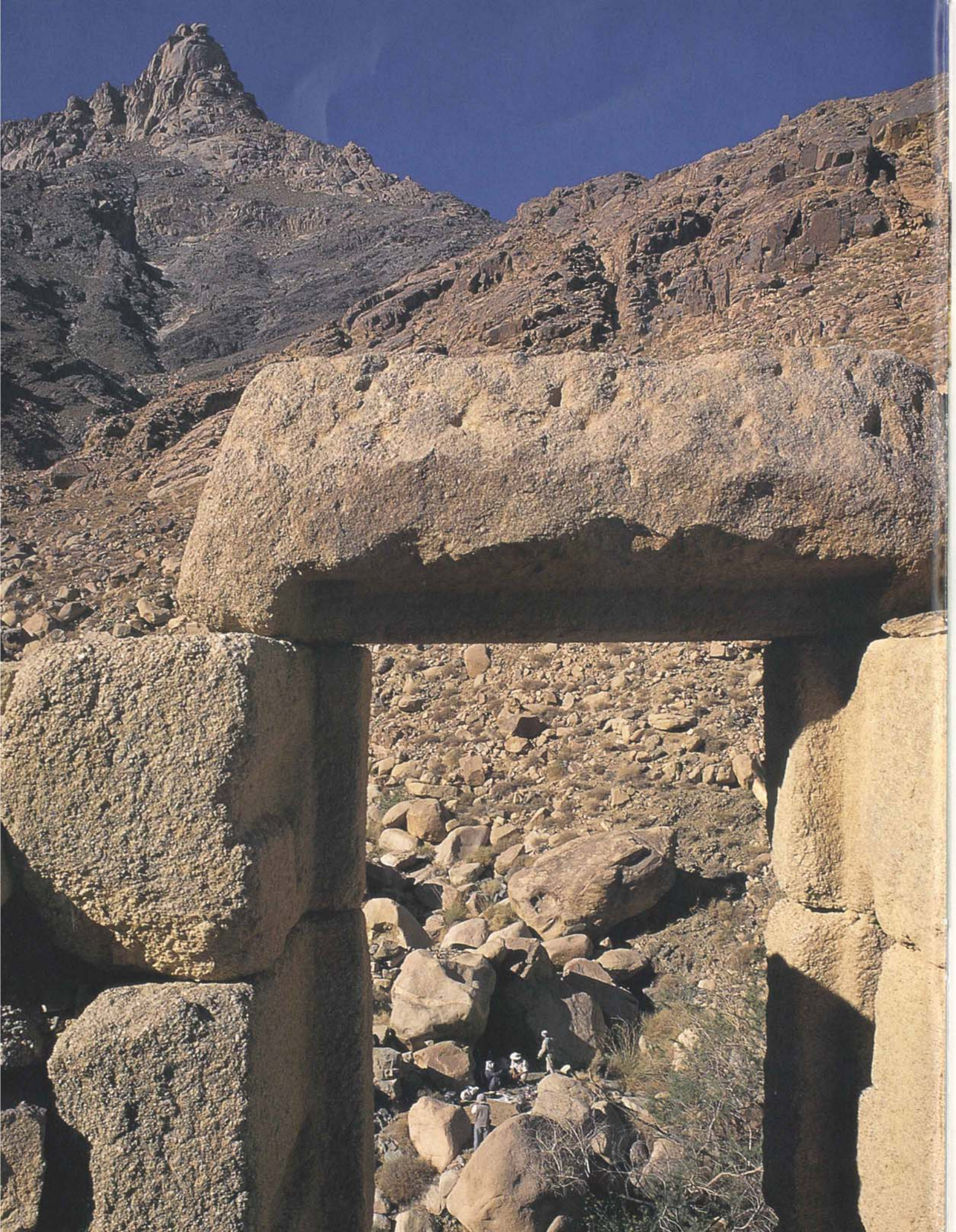
MAY/JUNE 1999

K.S.A. 100 YEARS

توحيد وبناء

The Dhow of Racing



22: KEVIN RUSHBY

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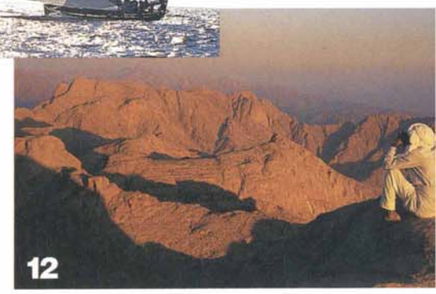

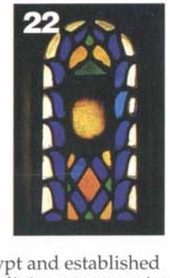

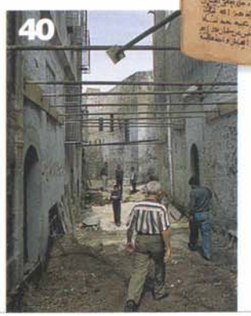

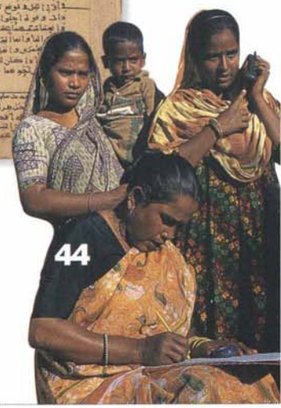

COVER:
Its lateen sail ballooning like a spinnaker, a racing dhow off Dubai heels to a fresh breeze as its crew hikes out over the rail to squeeze every possible bit of speed from the situation. Though competition has refined the boats' lines, both classes of racing dhow clearly show their descent from the pearling and trading vessels that furrowed the Arabian Gulf, the Indian Ocean and the eastern Mediterranean since the fourth century BC. Photograph by Jeff Harris.

OPPOSITE:
A portal of a ruined Byzantine monastery looks out on Jabal Umm Shumar, summit of Sinai's St. Katherine Natural Protectorate. The area's harsh beauty and its unique biome, shielded by national and traditional law, are watched over by Bedouin guards. Photograph by Joseph J. Hobbs.

BACK COVER:
Like a slice of full moon, a pane of alabaster will softly light a home in Sanaa. Photograph by Peter Sanders.

Saudi Aramco, the oil company born as a bold international enterprise more than half a century ago, distributes Aramco World *to increase cross-cultural understanding. The magazine's goal is to broaden knowledge of the culture of the Arab and Muslim worlds and the history, geography and economy of Saudi Arabia.* Aramco World *is distributed without charge, upon request, to a limited number of interested readers.*

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The Dhow of Racing

WRITTEN AND PHOTOGRAPHED BY JEFF HARRIS

For centuries before the oil boom of the 1970's, Dubai thrived on pearling and a mercantile trade that used the wooden dhow. Today, from the pier along Dubai Creek, the boats—now almost universally motorized—are still used to carry small cargoes. ***Previous spread:*** *With her mainsail in near-perfect trim and windward gunwale just above the water, the 18-meter (60') racing dhow* Sirdal *leads the first of three runs in its class in the 1998 dhow racing season.*

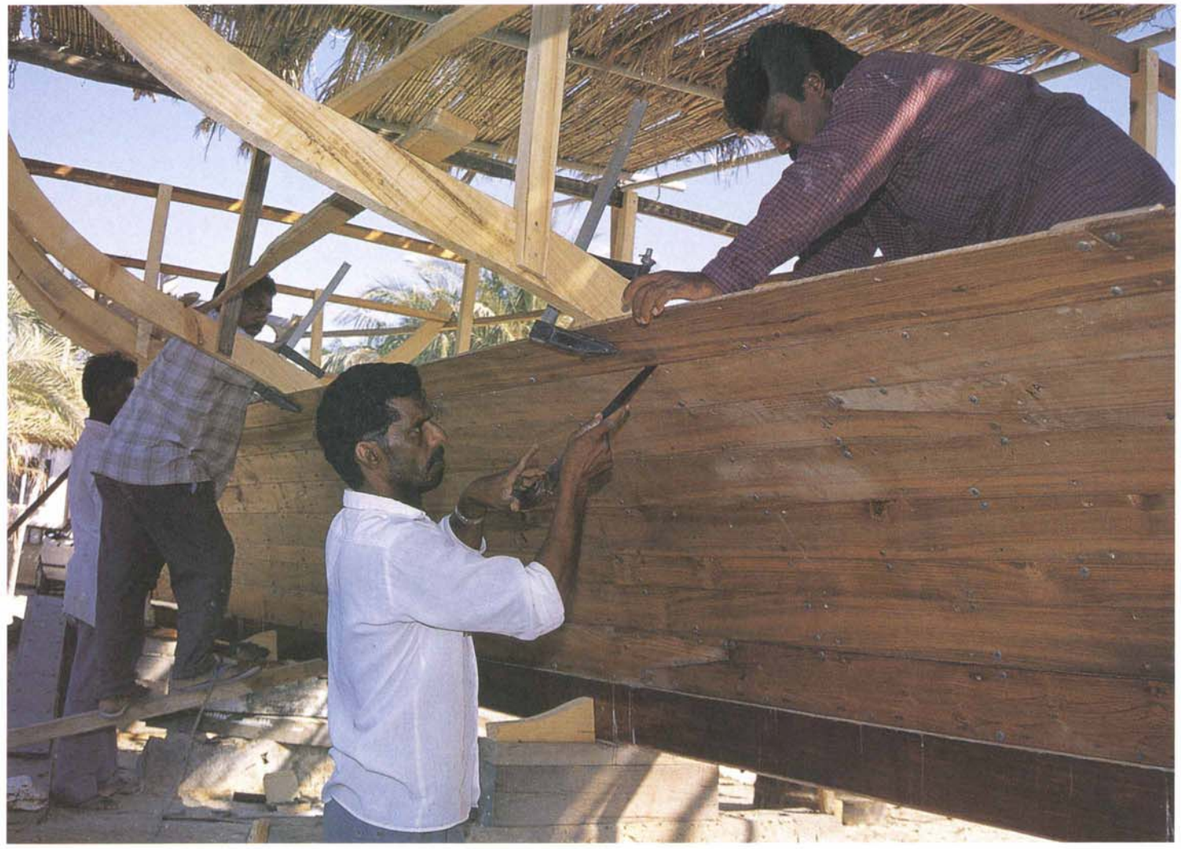
The stroke of the hour is signaled by twin flares and, as the orange smoke rises in the afternoon sky, there is sudden frantic activity in the coastal waters off Dubai's Port Rashid. Instantly, almost 500 men are hauling ropes in time to urgent, rhythmic chanting. Fifty white sails, each nearly as big as a tennis court, rise majestically and begin to billow, like a flock of giant swans spreading their wings to fly. As the soft curves of sailcloth fill with wind and take on tauter lines, sleek wooden hulls begin cutting the chop toward the starting line. The annual dhow-racing season in the United Arab Emirates (UAE) has begun.

Unlike racing yachts in Newport, Sydney or the Solent, where pre-start maneuvering is all-important, these racing dhows sit placidly, sails dropped, until the starting signal. When the smoke appears, each boat's 12-man crew works together to hoist up to the masthead the nearly 30-meter (90') boom that carries the sail. Here, no motorized winches are allowed: just blocks, tackle and muscle-power.

Today's race is called al-Shandagha, after the headland at the mouth of Dubai Creek that was the first landfall for merchants and fishermen entering Dubai's harbor. It's the first event in a three-race series for 18-meter (60') boats bearing at most two sails. The competing vessels are constructed in the traditional style of the coastal dhows that traded among Arabia, India and East Africa for centuries.

Those dhows, and ships of kindred design from Iran, India, Yemen, East Africa and Southeast Asia, have always moored along the long, snaking waterway that cuts through the center of Dubai. To this day, the city remains the most active dhow port in the Arabian Peninsula, with vessels tied up three and four abreast at dockside in the heart of the business district—a striking contrast to the city's marble-and-glass office towers. Though their masts have long been removed and engines built in, the dhows' designs are otherwise unaltered. Cargo ranging from sacks of rice and flour through crates of second-hand motor parts to electronic equipment in the original packaging is loaded and unloaded by hand.

In the mid-1980's, Dubai's deputy ruler HH Shaykh Hamdan bin Rashid Al Maktoum, who had already initiated several programs to maintain traditional crafts, conceived of a sailing competition to help reaffirm the region's historic link to the sea and revive the skills of local seamen.



At the al-Buteen boatyard, shipwrights of top racing dhows begin with a teak keel, from which ribs rise to the shape of the hull. The first planks to be nailed prove the most difficult, because they must be bent considerably. Tapping, hammering and patience make them fit.

Saeed Harib, managing director of the Dubai International Marine Club (DIMC), which oversees the races, says that the first ones, in 1986, "involved a few sailing dhows that had survived from the old days. But from that day on we have tried to encourage owners to improve the standard of the boats without affecting the basic design used by our forefathers." To do this, the DIMC inspects each racing dhow to be sure that its specifications are met, resulting in competition that is both safe and fair, and which calls on many of the skills of sailors of the past.

For example, the hull (*al-haikal*) must be constructed from teakwood, which may be varnished but not painted, for traditionally a dhow's hull was treated with lime below the waterline to deter barnacles and other growth, but the remaining timber was uncoated. Seasoned teak, often imported from India's Malabar Coast, had long proved itself the ideal marine timber: It does not split, crack or shrink in seawater, and is highly resistant to decay. The dhow's mast (*al-sari* or *al-duqal*) and bowsprit (*al-dastur*) must also be wooden. However, in a concession to the superior performance of modern materials, the massive sail-support spar may be made of aluminum or carbon fiber. Similarly, sails that originally would have been cotton may now be made of spun or laminated polyester cloth.

Even with these changes, however, a visit to the al-Buteen boatyard in Abu Dhabi, southwest of Dubai, is like traveling back in time. This yard, one of a handful in the Emirates, builds the best racing dhows and always has a backlog of orders. Hulls are still constructed in the open under palm-leaf awnings, surrounded by piles of massive seasoned logs. The work is labor-intensive, and an adz, or hand-axe, shapes major timbers while hand-saws and chisels finish details. No drawings or plans are used: Each design exists in the mind of the master shipwright. Owners constantly ask for modifications—thinner planking here or a different waterline curve there to improve speed—and these changes are made without compromising strength or seaworthiness.

"My father and grandfather worked here on the dhows," says V. P. Viswanathan, a finishing carpenter. "India has always supplied the men and the timber for shipbuilding in Arabia, and I am proud of this tradition." Like the teak logs with which he works, his family originally came from the Malabar Coast, in the southwest of the subcontinent.

The evening before race day, skipper Mustabbeh al-Marri checks the stitched edge of a new mainsail, whose expanse is more than double that of the mainsails carried by most international-class racing yachts. Traditional lateen sails were made of cotton, which was far heavier than today's lightweight, stretch-resistant polyesters that hold shape when wet and fill easily even in light breezes ***(opposite)****.*

On the water, a dhow is distinguished by its lateen sail, whose upper edge is lashed to the obliquely slung yard, which is in turn attached high on the mast by a massive rope parrel. Also called a fore-and-aft sail—indeed, it appears to be the ancestor of all fore-and-aft sails—the lateen probably originated in the western Indian Ocean. First a three-sided design, it was modified by cutting off the forward angle to form a short luff, or leading edge. The resulting four-sided sail, though still virtually a triangle, has been used on dhows for centuries, and it is still the standard today. The lateen has an enormous advantage over the multiple square sails used in the West up through the 15th century: It allows the dhow to sail well with the wind abeam, that is, at 90 degrees to the direction of travel, and even to sail passably well with the wind forward of the beam, at 50 to 60 degrees off the bow; square-riggers required a following wind.

In the 16th century, European ships began supplementing their square rigs with a triangular mizzen sail, which functioned similarly to a lateen. Its name came from *mizan*, which is Arabic for "balance." The mizzen allowed Western ships at last to make way in headwinds, and with this development the voyages to the Americas and around the Horn of Africa became possible.

The term *dhow* is not an Arabic word. It was adopted by English writers, perhaps from the Persian *dawh* or from the Swahili word for "boat," *daw*. Like the latter, it is a generic term. In earlier days, Arab sailing craft were categorized according to the design of their hulls (whereas European sailing vessels were categorized by their sail design), with *boom, zarooq, badan* and other specific terms referring to various double-ended shipshapes and such words as *sambuk, ganja* and *baghalah* used for ships with the square, "transom" sterns that the Arabs derived from European models in the 16th century. (See *Aramco World*, March/April 1974.)

All dhows were carvel-built, that is, with their wooden hull planks laid edge to edge rather than overlapping like clapboards, as ships are built in the West. The planks were stitched together using coir, a rot-resistant rope made from coconut fibers, which was passed through holes drilled in the planks. This light, sewn hull was well-adapted to the shallow, sandy waters of much of the Arabian Gulf. It could withstand a storm-driven grounding, and its broad, flat bottom allowed it to ride ashore on the surf or be drawn up on the beach for maintenance or storage.

Sailing Against the Wind

Lateen, like *dhow* itself, is a word based on a misunderstanding. Western Europeans first saw this kind of sail on ships from the eastern Mediterranean at the time of the Crusades. They called it a Latin sail; and the word reached the English as *lateen* because the English heard it from the French, and in French a sail is feminine: hence *une voile latine*. But the sail was not really Latin. It had reached the Byzantine Empire from the south and might better have been called a Muslim sail, because it existed on all the coasts the Arabs conquered after the time of the Prophet.

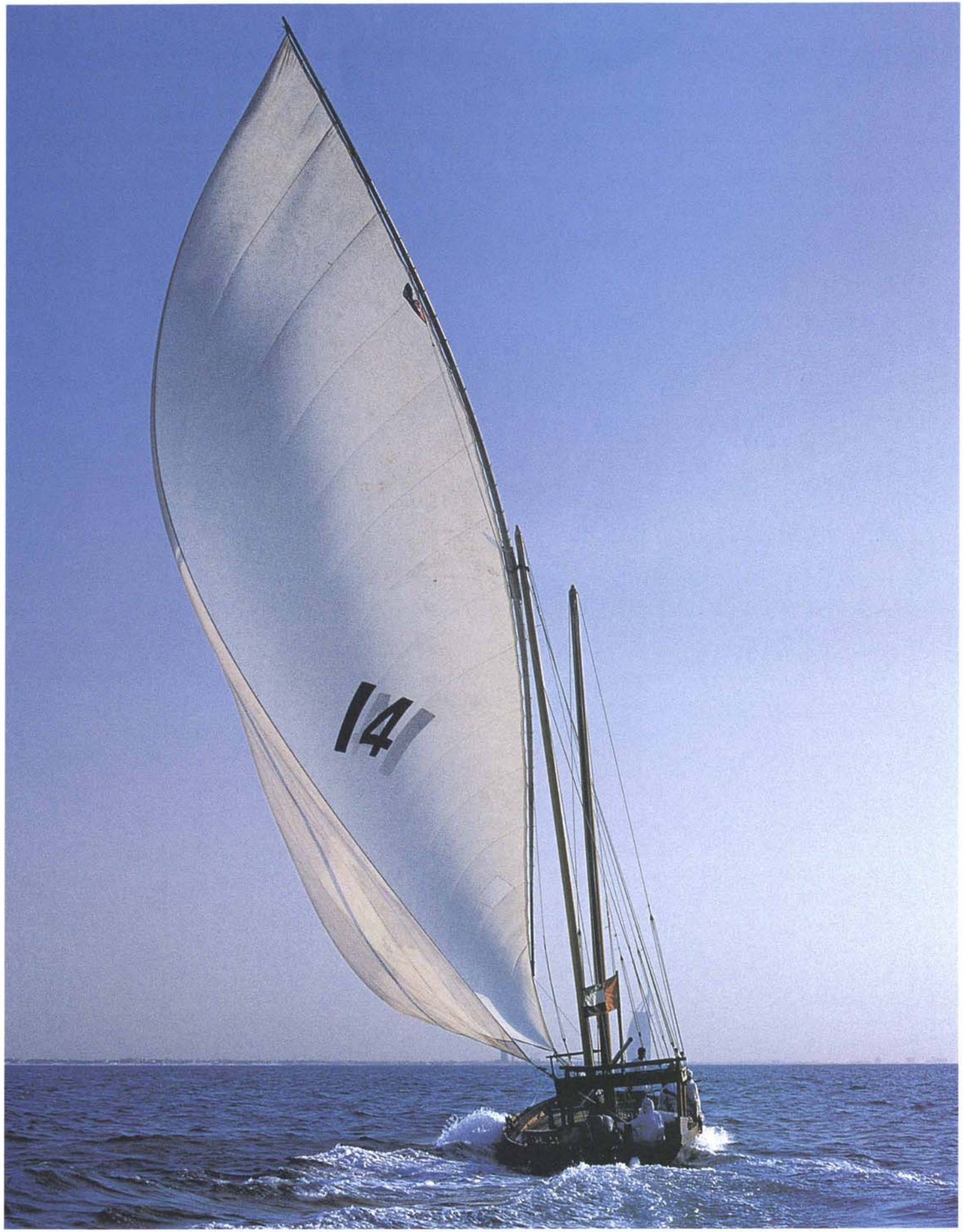
The ancient Greeks and Romans did not have it, nor did the Egyptians, but it is believed to have been in use in the Arabian seas since at least the fourth century BC. And since it spread all over the Muslim shores, it seems likely it was spread by the early Muslim conquerors and had its origin in Arabia like the faith itself.... Whoever [its] inventors were, the lateen was a momentous idea, for it was the earliest sail that enabled men to beat against the wind.

The essence of sailing against the wind is that the leading edge of the sail should be attached to something solid: the mast, a spar or a stay. A square sail, hung from a horizontal yard, can only be set at a limited angle to the wind before its leading edge is taken aback. But if the yard is tilted down toward the bows, the yard itself becomes the leading edge, and the sail can be set much closer [to the wind].

The Mediterranean lateen is a complete triangle, but the Arab lateen is not: Its forward corner is cut off, leaving a short unsupported vertical edge, ... a luff. This has been taken to mean that the Arab sail is an intermediate stage in the evolution , as if the Arabs had tilted their yards that far and never gone any farther.

But I think that is wrong. ...The lateen has a second advantage over the square sail: It means you can set a much bigger sail on a mast of the same height, and the Arab luff makes the sail bigger still. Suppose the mast is 65 feet [20m] above the deck, which is a normal height for a big dhow: The forward part of the yard cannot be more than the effective height of the mast, because the whole yard has to be swung up vertically when the ship goes about. The after part has to be longer and heavier...; altogether the yard would be about [37m] feet long. But in a triangular sail, the forward end of the yard is supporting very little canvas; by cutting off that corner you can add several hundred square feet to the [area of] sail [supported by the after part of the yard]. The luff has a hefty rope in it and is held bar taut by the weight of the yard, so it makes an effective leading edge. A dhow can set over 7000 square feet of canvas [650m²] in a single sail on a single 65-foot mast, much more than any other working rig that has ever been devised.

—David Howarth



It was not until the Portuguese set up boatyards in India and Persia that iron fastenings started to replace coir in some vessels. To demonstrate the remarkable skills of the early Arab seafarers, British author-explorer Tim Severin built a hand-stitched dhow in Oman in 1981, and with a crew of 25 sailed 9600 kilometers (4300 mi) from Muscat to Canton, navigating using instruments from the Middle Ages. (See *Aramco World*, September/October 1981.) Severin's account portrays the hardships encountered by early sailors, and today's racing program in Dubai is a small reminder of the demands of life at sea.

In the few days preceding a race, activity is intense. One evening, close to sunset, I was taken to a little harbor to witness the work. On the beach, the sand was covered with a vast white sheet, and men were squatting around its perimeter sewing. This was a new mainsail for the dhow *al-Munadi*, and its approximately 140 square meters (1500 sq ft) was roughly double the area of sailcloth an international racing yacht would carry. As members of the crew were attaching the rope that stiffens the upper edge of the sail and allows it to be stopped to the spar, it occurred to me that this scene would have changed but little over the last few hundred years.

"Racing is a family affair," said skipper Mustabbeh al-Marri. "Grandfathers, fathers, sons, uncles and cousins can often be found on the same team, as you see here." At the nearby breakwater, a dozen or so racing boats were lined up on road trailers, their masts, bowsprits and spars lashed to the decks. Owners discussed tactics, while crew-

At the start of the race, crews gain vital seconds by being among the first to raise sails. The leader, at right, has raised two in the time that the second and third boats have raised but one—a sign of impressive on-board teamwork. ***Left:*** *In the absence of a keel, sandbags act as ballast that can be distributed according to wind direction.* ***Opposite:*** Kariyat al-Boom, *skippered by Mohammed Rashid bin Shaheen, takes a pre-race practice run.*

Crews of the three leading vessels of the 1998 season pose with awards at the Dubai International Marine Club. First place went to the crew of al-Raed, *skippered by Majid al-Mahari; second place to that of* Sirdal, *skippered by Ahmed al-Rumaithi, and third place to that of* al-Taf, *skippered by Saif al-Rumaithi.*

muscle rigged the boats. The longer, 18-meter vessels use two masts, which improves speed and stability, and these have to be hauled into position and raised to the vertical, stepped and lashed into place. Lines need to be made fast, booms attached and sails tied on. As if basking in their own sense of tradition, the men—many of whom had probably spent their working day in modern offices—sang sea chanteys while they worked, silhouetted against the evening sky.

The following morning, the day before race day, it was time for warm-up runs out of the DIMC marina. I was welcomed aboard the 18-meter, two-masted *Arhab*, and a motorized support boat towed us out of the harbor. Once clear of the land, the tow was released and on a brief command the crew started to raise the mainsail. The wind was steady but not strong, probably 10 to 12 knots. Even so, we picked up speed quickly, and in no time, due to the dhow's lack of fixed ballast, we were heeled over at an angle that a Western sailor would find alarming.

Built without a weighted keel, large dhows are actually as frisky and unstable as a racing dinghy. A modern yacht of similar size would carry around 2000 to 2500 kilos (4400–5500 lbs) of lead or iron in the keel, shaped into an underwater fin that counterbalances the pressure of the wind on the sail. Traditionally, dhows stowed their heavy cargo low in the hold to assist with balance, and today's racers use around 50 sandbags of a few dozen kilos each to perform the same task. As the wind freshens, these sandbags have to be shifted about to keep the boat optimally trimmed. Fine-tuning this balance is accomplished by shifting the weight of the crew members, who lean precariously over the side as necessary. If the wind dies, the captain can elect to dump some sandbags overboard to reduce weight and increase speed, but if the wind freshens again the boat will then be difficult to manage, and the risk of capsizing can become quite vivid.

Aboard the *Arhab*, I was impressed by the teamwork. As soon as the spar had been fixed at the top of the main mast, hands were trimming the sail to produce that ideal, taut curve that would power us up to maximum speed. Saeed al-Tayer, the captain, hunched over the tiller and steered onto a beam reach, the course on which the wind is at 90 degrees to the boat, and which maximizes the sail's airfoil effect. Meanwhile, the crew was setting another sail on the second, smaller mast. Instructions were shouted from man to man until they were happy with the sails' finely tuned trim. By now we were skimming along at an exhilarating pace—probably around 10 knots—close to the water and gazing up at an expanse of white sailcloth that seemed not much smaller than the water itself.

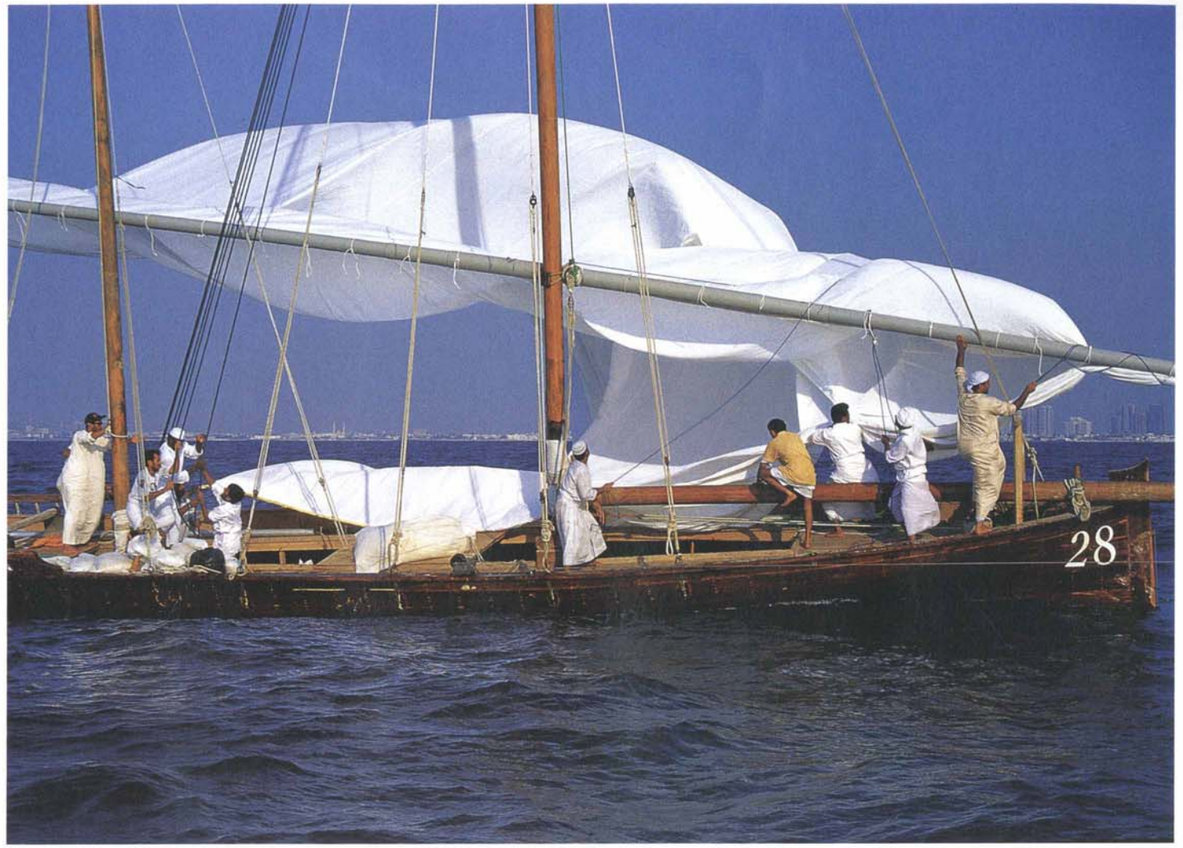
"I used to race power boats and buy the biggest outboard engines I could afford," Saeed told me from the tiller, "but that doesn't compare with this experience. Under sail you really feel the sea and the weather. It makes me realize what a tough job our forefathers did. They had to be out here every day to make a living."

Just as we settled down to enjoy the day's practice, Saeed gave new orders and the crew dropped the sails. Only frantic activity kept the mainsail from sliding into the water. A minor adjustment in sail position, in turned out, would help improve speed.

Back on shore, Saeed Harib of DIMC explained more about the background of the races. "At first it was the older generation that participated, men who knew the techniques of sailing from their jobs at sea. Now we have a mix of ages, with younger men in the majority. The young people are more competitive, and they try to learn from the designers of international racing yachts, like the America's Cup winners, and apply those ideas to the dhow" within DIMC's tradition-oriented limitations. "A side effect of these events," he adds, "has been to revive the language of the sea, the words that refer to parts of the dhow and points of sail. Around 100 terms that were mostly unknown to this generation have come back into use."

There are two different race formats: the al-Youssh course, which is one straight leg from start to finish, and the al-Khayour course, which includes a designated turn. There are three annual events for 13-meter (43') dhows with crews of 10, and three for 18-meter (60') boats with minimum crews of 12 men. The position of the starting line depends on the wind direction just before the race, and it is set so that the boats can easily complete the course. But as any sailor knows, the wind may change direction and speed many times during a race.

This makes dhow racing particularly tricky. Unlike modern racing yachts, the dhow cannot easily turn across the wind. (With a headwind, this turn is called a tack; with a following wind, it is a jibe.) Each maneuver requires the mainsail to swing to the other side of the mast—quickly done on a contemporary sailboat. On a dhow, however, the heavy mainsail spar must be freed from the mast and lowered slightly, and its front end dipped almost to vertical and swung around the base of the mast to the other side. At the same time, the four shrouds supporting the mast as well as the line to the parrel—the sliding rope collar that attaches the spar to the mast—must also be transferred to the other side. "Even when the crew are working well together, and the wind is not too strong, this takes five to 10 minutes," says Ahmed Hassan Abdullah, the skipper of *al-Ghayoon*. "On the longer races we sometimes have to decide between a faster course, with many changes of direction, and the slower way with less work on the sails."



Coordination between fore and aft teams, which is crucial to the quick, even lifting of a sail, is often aided by chants and songs. After the sail is up, crew members attend to the adjustment of each rope and block, trimming them as often as necessary to achieve maximum performance.

In 1991, a race of 50 nautical miles (93 km, 57 mi) was added to the season, on a course called al-Qaffal, or "homeward run," to Dubai from Sir Bu Naair Island, the traditional end-of-season gathering point for pearling boats. In the old days, each captain, or *nokhatha*, raced to be the first to arrive in Dubai and greet his family after a season at sea—and perhaps get the best price for his pearls. Now, this final event of the dhow-racing season has become the greatest test of sailing and navigational skills for those rivals' competitive descendants.

"I remember that we had only 15 entries for the first Sir Bu Naair," said Shaykh Hamdan at a post-season press conference. "But in 1998, 87 boats registered. This shows the increasing acceptance of the event, particularly among the younger generation."

That younger generation is well represented in today's opening race, a run of 13½ nautical miles (25 km, 15 mi). By the time the orange smoke has cleared and the rhythmic chanting has died down, the competitors are well past the starting line. Old adversaries vie for an early lead, with *al-Raed* taking the inshore line and *Sirdal*, last year's overall winner, pulling away on the offshore flank. With the wind at 12 to 15 knots and waves cresting at nearly a meter, conditions are ideal and the pace is impressive. Choice of the exact course is everything, and skippers crouch down with the breeze in their face to try to sense the best passage across the shimmering sea. Local knowledge and a keen ability to read ripples on waves for subtle wind shifts are crucial to success; there are no speed logs, wind gauges, depth sounders, weather computers or satellite positioning systems here.

Almost an hour later, with the finish buoys in sight, *al-Raed* takes a small but convincing lead, and an exuberant cheer rolls across the water from its crew as it crosses the line. *Sirdal* is second, piloted by Ahmed al-Rumaithi of Abu Dhabi, whose family is a virtual dhow-racing dynasty.

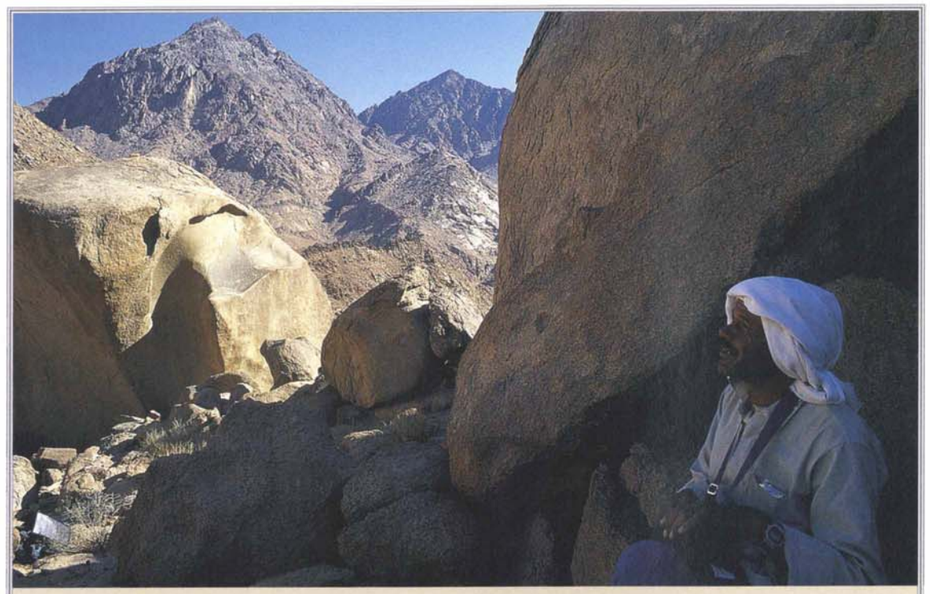
Soon after the race is over, Majid al-Mahari, captain of *al-Raed*, accepts the first-place trophy cup and the government-sponsored prize money at a ceremony at the DIMC. Throughout the evening, captains, crews and their families debate the tactics they'll use in next year's races. Time may have changed the men who ply the waters of the Arabian Gulf, but the Dubai dhow races ensure a lasting place for the region's unique sailing traditions.

Sport sailing never paid Jeff Harris's bills, so he became a film director. He works for Saudi Aramco's Media Production Division in Dhahran.

SINAI'S *Watchmen* OF THE *Wilderness*

WRITTEN AND PHOTOGRAPHED BY JOSEPH J. HOBBS

In a sense, Mahmoud Mansour was born a ranger. His grandfather was a *hakim*, an elder of the Jabaliyyah Bedouin tribe that has inhabited parts of the mountains of south Sinai for more than 1500 years. His grandfather, Mansour says, "knew the world in all its dimensions," and from him Mansour learned which plants to use for which kind of ailment, when to move the herds from mountain to valley pastures, how to inspire confidence in difficult times, and how to give wise counsel. But mostly Mansour learned a love of the land that was the livelihood of his family and tribe.



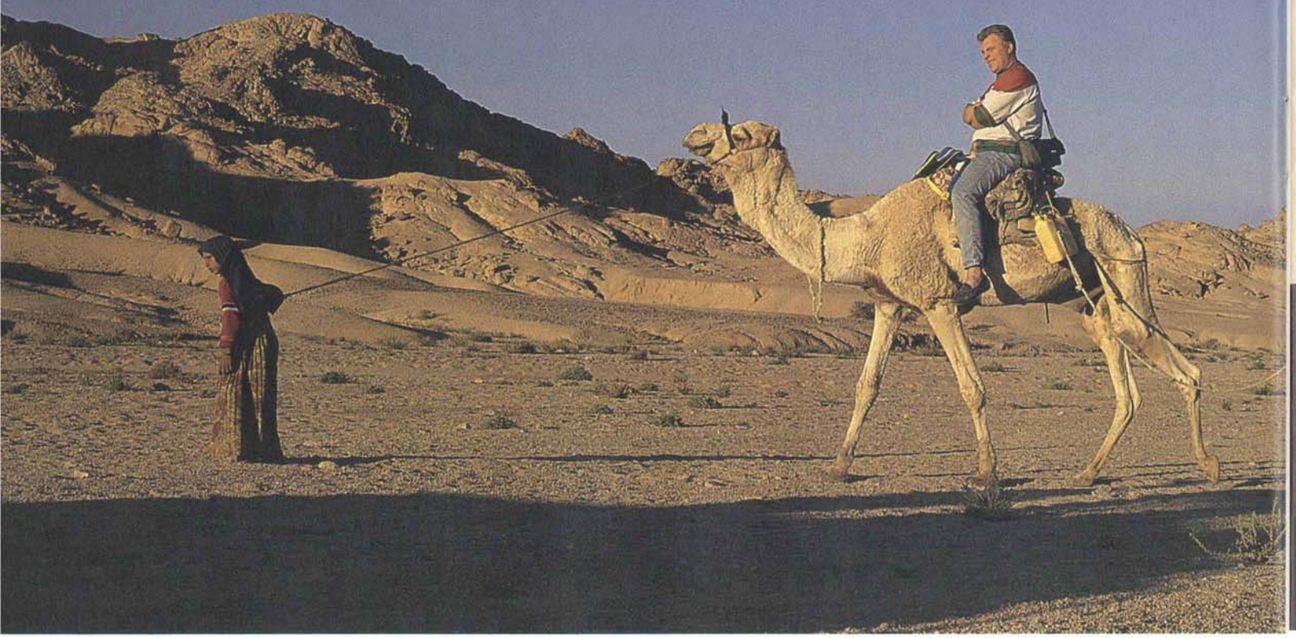
In the late 1980's, Mahmoud Mansour was the first of the Jabaliyyah Bedouin to show the St. Katherine area to an official from the Egyptian Environmental Affairs Agency (EEAA). ***Opposite:*** *In 1996, representatives from the area's six tribes gathered under the auspices of the Bedouin Support Program of the EEAA to discuss Bedouin initiatives for administering the protected area.* ***Previous spread:*** *The 7000 Bedouin of the region subsist largely through gardening, herding, tourist guiding, seasonal jobs, and remittances from relatives working in the Nile Valley and abroad.*

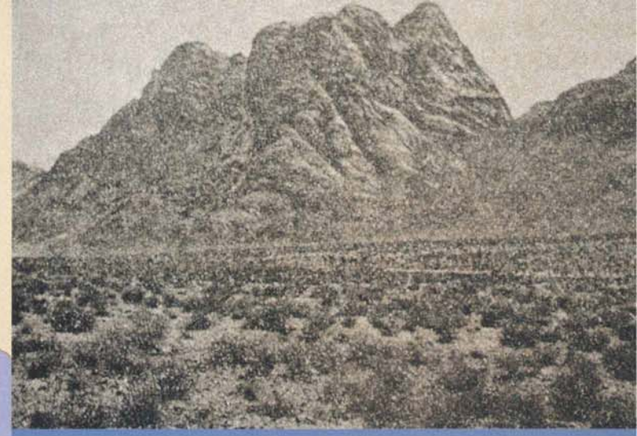
Wearing, in effect, his grandfather's mantle, Mansour has for much of his 40-odd years immersed himself in one of Egypt's most abundant and delicate natural environments. When he has had the time, he has taken it upon himself to walk for days at a stretch to see mountains he had not seen before, and along the way he has made himself an expert in the region's plant and animal life. He has bathed in nearly all of the many granite-lined pools, and often interrupted his sojourn to repair a trail or a water hole, or to help one of his approximately 1500 fellow tribesmen with his garden, much as they might help him with his.

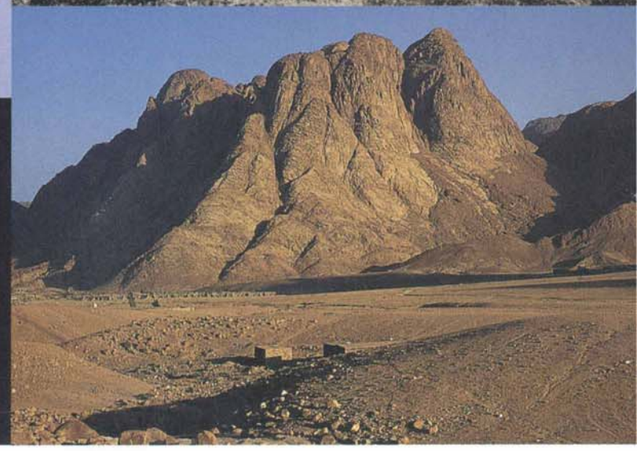
Although he supplements his agricultural income with guide work and other odd jobs about the town of St. Katherine, Mansour is one of relatively few Jabaliyyah who still spends substantial time in the highland gardens that once were among the tribe's primary sources of sustenance. (See *Aramco World*, March/April 1995.) With help from his wife and three children, he keeps sheep and goats, and he tends peach, pear, pomegranate, quince, apricot, olive and even a banana tree in a rock-walled garden about two hours' walk from the famous sixth-century Monastery of St. Katherine.

In his garden, he has both admired and cursed a wily cast of characters who plunder a portion of his produce—mostly foxes, hyrax, ibex, chukar partridges and Sinai rosefinches. He is reluctant to describe them as pests, and he has never resorted to killing them. But he has thought long and hard about how to come to terms with them: He could put netting over the bearing trees, but where could he find such netting in St. Katherine, a town whose largest store is only a single small room? And what about protection for the hundreds of other rock-walled orchards tended every summer by his fellow tribesmen?

The relationship between protected areas and the indigenous people who inhabit them has frequently proved to be difficult for all.







In 1989, I had the privilege of spending seven months walking with Mansour—whom I came to know simply as Mahmoud. As a geographer who had learned much about Bedouin life in Egypt's Eastern Desert, I was in Sinai to focus on Bedouin perceptions and uses of natural resources. I shared my results with the Egyptian Environmental Affairs Agency (EEAA), which was exploring the idea of conferring some form of protected status on the region.

As Mahmoud and I conversed, I learned he was deeply supportive of nature protection because he was so dismayed by what was happening around him. Most Jabaliyyah gardeners, it seemed, were solving their predator problems with air rifles and traps. Men of his and other tribes had hunted ibex until these great mountain goats had become so rare, and so shy of humans, that he could walk for months without seeing one, though they used to inhabit the mountains in numerous small herds, and were famous for showing themselves fearlessly. Trees and shrubs, historically protected by tribal laws, were more and more being cut with impunity for fuel and fodder by Bedouins whose livelihoods no longer depended so heavily on the land.

Mahmoud, it turned out, had thought hard about how Sinai's wildlife might be preserved, but he was skeptical about the extent to which his compatriots might support any kind of official scheme. His unhappy conclusion was that there would have to be a fenced-off reserve, a kind of outdoor zoo, within which both the several thousand tourists who visit the mountains each year and the local Bedouin could experience what would be left of south Sinai's wilderness. He figured that the mountain bloc known as Jabal Abbas Pasha—an area roughly the size of the Cairo Zoo—would be suitable. His sentiments were shared by a few EEAA officials, and Mahmoud had escorted one to introduce him to the place.

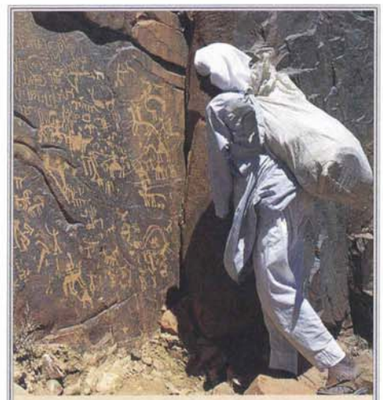
At that time, however, the EEAA was concentrating on its work with the European Union to set up Egypt's first national park, the marine sanctuary at Ras Muhammad at the southern tip of Sinai, host to some of the largest and most delicate coral reefs in the world. In St. Katherine, about 100 kilometers (62 mi) inland, there had for several years been occasional talk about developing a protected area, but little real progress had been made. Yet as eager developers submitted proposals for sprawling hotel complexes and even a cable car up Jabal Musa—widely believed to be the Mt. Sinai of the Qur'an and the Bible—the urgent need of protection grew.

In the early 1990's, the EEAA and the EU began to turn their attention toward the interior of the peninsula, including the Monastery of St. Katherine and the surrounding montane wilderness. By 1996, the Zoological Society of London had become involved, and through it the partnership hired Dr. John Grainger, a self-effacing Englishman who had helped Saudi Arabia develop its national system of protected areas in 1990, and who had also helped in similar developments in Kuwait, Ghana and Sri Lanka. Grainger was thrilled by the natural and cultural diversity of the St. Katherine area, its scenic grandeur, and its potential for scientific research, wildlife restoration and environmentally sensitive tourism. As he spoke to audience after audience throughout Egypt, drumming up backing for the project, he said repeatedly and with heartfelt conviction that "St. Katherine has the potential to become one of the world's great mountain parks."

Today, a decade after those months of walking and camel-camping under the stars, the single mountain that Mahmoud recommended be preserved lies within one of the largest, most resource-rich and most complex protected areas in the Middle East. The 4350-square-kilometer (1740-sq-mi) St. Katherine Natural Protectorate includes the entire high mountain massif of south Sinai as well as portions of its adjacent coastal plains. More than 7000 Bedouin belonging to six tribes live within and close to its borders, along with 27 species of plants found nowhere else in the world and fauna that includes hyenas, wolves, and perhaps even leopards. A budget of more than nine million dollars is sustaining an initial five-year project, renewable in 2001, to establish and manage the preserve.

As for Mahmoud, he is now employed doing what he was surely born to do: With 24 other Jabaliyyah Bedouin, he is a *haris al-biyah* ("nature guard," commonly translated as "community guard"), whose duty it is to see that the project succeeds both in protecting nature and improving human welfare within the park.

TOP RIGHT: REPRINTED FROM NA'UM SHUQAYR BEY, *TARIKH SINA (HISTORY OF SINAI)*, CAIRO: MATBA'AT AL-MA'ARIF, 1916.



Community guard Musa Mansour examines one of the protectorate's several pictograph walls with both Neolithic and Nabatean inscriptions. ***Top right (2):*** *The Plain of al-Raaha, near St. Katherine, has been denuded by overgrazing since it was photographed in the early years of the century.* ***Opposite:*** *Tourism, while adding to local and national incomes, also adds pressure to sensitive ecosystems.*

The relationship between protected areas and the indigenous people who inhabit them has frequently proved to be difficult for all. In Zimbabwe in the 1920's, for example, and in Uganda in the 1950's, the Ik and San people, respectively, were driven from their traditional homelands to make way for parks that catered primarily to expatriate and foreign tourists. Both of these relocations brought famine and social disruption. In Kenya, during a drought in the 1970's, local people were denied access to the game animals in Tsavo National Park, their traditional food reserve, and the resulting resentment led to spiteful poaching and a general distrust of wildlife authorities.

From the outset of the St. Katherine project, Grainger and his mentor at the EEAA, Natural Protectorates Director General Ahmad Shehata, adopted an assumption that is increasingly popular, but still largely untested: Inhabitants, tourists and wildlife can coexist.

Shehata, to his lasting credit, believed that to make the assumption a reality, the St. Katherine project would have to begin by talking with the local Bedouin about

their concerns. This was unprecedented in park development in the Middle East, and it is rare anywhere in the world. The effort grew into what is today called the "Bedouin Support Program," through which up to 10 percent of the park's budget is directed to the needs of local people, who are in turn encouraged to invest their energies in supporting the park's conservation-oriented objectives.

In 1995, a year before the protected status was scheduled to take effect, I returned to St. Katherine and spent four months recording conversations about day-to-day Bedouin problems and possible Bedouin contributions to the park project.

The following summer, Grainger and Shehata commissioned me to head a team to prepare specific recommendations on the Bedouin role in the park. The team included Egyptian and international anthropologists, a community development specialist, a pediatrician, and staff from Ras Muhammad National Park. Throughout the summer, all around south Sinai, over endless rounds of sweet tea and sumptuous meals of goat meat served over rice, in black wool tents, cinderblock houses and under the shade of acacia trees, we researchers conversed with Bedouin men and women about their livelihoods, their problems and their hopes. Our tapes and notebooks recorded recurring, deeply practical needs: more jobs, more income, better medical care, more access to fresh water through more and better wells, help in the gardens, pest control, and much more.

Late that summer, more than 100 Bedouins representing all the park's tribes, clans and settlements turned out for a *majlis*, a special "sitting" or conference for discussion and celebration of the project's Bedouin-oriented initiatives. The research team reported what it had learned from the people and outlined the park's action plan for the next few years. The Bedouins were more than a little pleased to learn that many of their suggestions would come to pass, and that one formed a core element of the park: Under the leadership of a professional Egyptian ranger team, 25 Bedouin men, representing all the park's tribes and covering each of its major geographical regions, would be hired as full-time, salaried "community guards." In a tangible sense, this would turn the St. Katherine Natural Protectorate into a park by and for the people who lived within it.

After field visits among the tribes, the Bedouin Support Team consolidated tribal recommendations. ***Opposite:*** *Each "community guard" is assigned a territory: For Iftayh Musa of the Awlaad Sa'yiid tribe, this is Wadi Isla in the southwest, one of the most sparsely inhabited, least-accessible regions of the park.*

What the Bedouin Support Program team learned that led to this recommendation was that conservation is nothing new to the Bedouin. Jabaliyyah tribesman described a system they called *al-hilf*, "the agreement," in which everyone in the tribe agreed not to allow their sheep and goats to forage in mountain pastures above about 1700 meters (5400') between December and May, to give delicate spring plants time to flourish before being pressured by hoof and palate. Muzayna tribespeople, who number roughly 2000, described their own system, which they called *dakhl* ("essence"), in which an individual man assumed responsibility for the protection of a particular group of trees.

Both tribes used traditional tribal law, called *'urf*, to enforce these systems of protection. For example, among the Muzayna, one who cut green limbs or destroyed a tree was fined in cash or livestock, and the fine was turned over to the man who detected and reported the violation. Likewise among the Jabaliyyah, anyone who caught a violator of the seasonal reserve could collect a fine directly from the transgressor.

Members of all six tribes recalled past decades when individuals among them had been personally responsible for the protection of ibex in particular areas. Muhammad 'Iyd, a graybeard of the Ghawalma, stated that he was still responsible for the welfare of ibex near the eastern border of the park, and he listed off all the mountains in his domain: Maytuura, al-Hayaala, al-Misma, Nagabayn, al-Huwaym al-Mugalala, al-Miyraad, al-Mawga, Abul Dhagg, al-Baraadi, al-Murra, Budhayna, al-Sadr, Abu Turayfiyya, al-Araada, Mirayyih.... By all accounts, it is thanks to 'Iyd's concern that the ibex on these remote mountains are among the only ones in south Sinai that live free from human influence. That is the essence of *'urfi* law: A person pledges to uphold a principle that all tribespeople regard as just, and as long as the person lives and perpetuates that pledge, acting against it violates both his personal honor and *'urf* itself.

The problem for Sinai wildlife is that there are fewer and fewer people like 'Iyd who are willing to stake their honor to protect trees and four-footed creatures. Life in Sinai has changed. Most Bedouin are seminomadic at most, and their sustenance now comes largely from wage labor as tourist guides, hotel keepers and assistants, construction laborers and truck drivers, and from work in the distant Nile Valley and even abroad. Livestock numbers have declined by as much as 90 percent in a generation, making it virtually irrelevant for the tribe to think about keeping a fodder reserve in the mountains. As each component of the indigenous livestock-and-agriculture economy becomes less important to the society, the conservation ethic that sustained it dies too—remembered by the old, but to the young only a vague vestige of some past time.

Until now. When the Bedouin talked with park personnel about the way things used to be, they found themselves painting pictures of lush landscapes teeming with wildlife, and this often led to words expressing a desire to recover some of that heritage. Musa Muhammad Abul Haym of the Jabaliyyah mentioned a photograph he had seen in *Tarikh Sina (History of Sinai)*, a book published in 1916. (See previous page.) "Did you see what the Plain of al-Raaha looked like then? It was all covered with large *silla* bushes. That is what we could see again here, if we gave the place some protection."

Another Jabaliyyah man, recalling accounts by his grandfather, reckoned it had been 75 years since ibex, gazelles, grackles and partridges would allow men to approach them. But, he said, "if we do not kill the animals they could become as approachable as they were before." All over south Sinai, the park researchers heard a repeated refrain of Bedouin confession and appeal: "We used to have a better environment; we destroyed it; we can get it back if we work for it."

In reply, the researchers asked what the park could do to help in this recovery. At meeting after meeting the answers were nearly identical: The park should use *'urf* to

The park researchers heard a repeated refrain of Bedouin confession and appeal: "We used to have a better environment; we destroyed it; we can get it back if we work for it."

assign responsibility for nature protection in specific areas to individual men. The *haris al-biyah*—the term was a Bedouin one—should be employed by the park to patrol a designated area; in it he would keep track of the numbers and movements of wildlife, supply water to ibex and other animals in times of drought, document violations of park conservation laws, collect trash, help backcountry hikers in emergencies, and perform other useful good deeds as befitted his title.

There should be three or four community guards assigned to each of the larger wadi-and-mountain blocks, the councils tended to agree, and they should not sit in an office or house somewhere but be mobile men, *'ahl al-makan* ("people of the place"), residents or frequent users of their areas of responsibility. Above all, they should not be chosen for political reasons, because they were members of shaykhs' families, or men whom the tribe owed a debt. They should work full time, with a salary, because, the men agreed, only that level of responsibility would make any violations of park conservation laws also a violation of *'urf* laws. Hunting ibex or cutting trees in an area patrolled by a community guard would constitute a violation of his very livelihood.

Thought by some to be among south Sinai's more than two dozen endemic plant species, the oriental blackberry (Rubus sanctus; 'ullayq *in Arabic) is believed by the monks of St. Katherine's monastery to be the bush that burst into flame before the prophet Moses.* ***Opposite:*** *Community guard Musa Mansour looks out from Jabal Sirbal over the protectorate's northwestern periphery.*

During the months following the *majlis*, Ali Metrash, one of five Egyptians working in the protectorate whose university degree allows him to assume the title of ranger, carried out the delicate task of choosing the community guards. Ali's training as an anthropologist served him well as he conducted scores of interviews among each of the tribes. He collected information about which tribes and clans were presently responsible for particular wadis and mountains, and then he carefully drew the lines of responsibility on his maps. He asked the tribal shaykhs to supply their own nominations, and he also sought the opinions of a wide range of tribal members. In several cases, he recommended a popular choice over a shaykh's choice, in an attempt to check political power without undermining it.

By July 1997 Metrash had formally invested 16 men with the authority of community guard. He and the other four university-trained rangers began spending most of their days walking with these men, and in a process of mutual discovery the roles of community guards and park rangers began to evolve.

Now, it is established that community guards assist the park rangers by reporting any hunting, killing, disturbance or collection of wild species occurring in their respective patrol areas. They monitor and report on the status of wildlife populations, and they set up watering stations for animals. They keep an eye on building and rock-quarrying activities, which take place mostly on the coastal fringes of the mountains, to be sure these are done within the restrictions of their permits. When Bedouins or tourists are injured in the mountains, community guards are there to assist in first aid and evacuation. They report on the conditions of foot trails and vehicle tracks, and perform or arrange for their repair.

Community guards also track the numbers of visitors and their destinations, and they instruct their fellow Bedouin, who work as guides escorting all backcountry tourists, in the basic rules: no cutting of vegetation, no graffiti, no litter. When tourists are not compliant, it falls on the community guard to clean up.

As park employees, community guards also explain and seek support within their home districts for other Bedouin Support Program policies. These include visits to both town-based and back-country Bedouin settlements by doctors and veterinarians, as well as the services of a specialist who is helping women improve the quality of their handicrafts, so that they can market the crafts to tourists and increase their income. In Cairo, park officials are lobbying for legislation that would require off-road tour operators in the region to hire a Bedouin guide—a move that would promote both jobs and responsible tourism.

By late last year, the number of community guides had risen to 25, and there are plans to add six more. In the course of discharging their duties, they have already seen a fair bit of high-country action: Faraj Musa of the Muzayna followed suspicious-looking vehicle tracks to what turned out to be an illegal quarry inside the park, and authorities put a stop to it. In Wadi Ladiyd, near the park's wild and inaccessible southern boundary, Sami Aflan of the Hawaytaat tracked down and intercepted trappers of rare falcons that the poachers would have sold abroad.

Jamil Ataya discovered the dens of several hyenas, a species whose numbers have been in decline, and he began pleading for the animals' protection among his fellow Bedouin, who were well-accustomed to killing both hyenas and wolves that prey on their livestock. This is one of the more delicate issues for the park, whose conservation mandate extends to all wildlife. At present, the park staff is studying the possibility that tourist income derived from viewing these wild predators might help offset livestock losses. But in the meantime, the burden of protecting the marauders falls on the community guard, who must persuade individual after individual to take a hands-off approach.

Murdhi Hamdaan of the Muzayna engaged in water-rights diplomacy when several of his enterprising tribesmen struggled to install three 14-kilometer (9-mi) pipelines to deliver water from a mountain well to the burgeoning coastal tourist settlement of Dahab. Although they sold the water at a tidy profit, their gains meant losses to the Bedouin shepherds and date-palm farmers at the headwaters, the oasis of 'Ayn Kid, whose waters were quickly depleted. As community guard and respected elder, Murdhi was called upon to mediate the conflict, and he engineered a compromise whereby the entrepreneurs were limited to a single pipeline, sourced higher than originally, that would draw water only when the remainder could still meet local needs.

In this region, however, there is at times too much water: Only days after flash floods in September, Jabaliyyah community guard Zaayid Muhammad had repaired several washed-out walking trails and runoff drains. Nearby, Mahmoud had been building waterless composting toilets just below the summit of the world-renowned pilgrim and tourist site of Jabal Musa, the first such facilities on the most heavily traveled trail in all of Sinai.

"So many things have changed since the protected area was established," says community guard Isma'il Ibrahim. "The Bedouin used to throw down garbage. Now they collect it." Like other community guards, Isma'il was chosen because he was already respected, and now the work he does for the park seems to be reinforcing the respect in which he is held, evidenced by the assistance he receives from other Bedouin.

Zaayid Muhammad explained his impressions of his role: "It's our country. We need to take care of it. If we don't, who will?" By investing the responsibility for the park in the people who most benefit from an improved environment, the program seems to be working well.

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I last visited Mahmoud in the summer of 1997. We sat together in the shade of rocks atop Jabal Umm Shumar, the lofty apex of the St. Katherine Natural Protectorate, and he spoke about the park's progress. Gone was the pessimism of a decade ago, and in its place was now a deep satisfaction at having played a key role in such a significant project.

Speaking about the mountain, its wildlife, and the future, he recalled being told that "about 200 years ago, there was a terrible drought all over this area. Then people began to notice that ibex were congregating here on Jabal Umm Shumar, in groups of 40, 50 or more. Then it began to rain, and it kept raining, and the drought was broken. So to thank God and the ibex, the people declared that hunting ibex around Umm Shumar was forbidden. Over time, this promise was forgotten. Now we see the people are remembering such things, praising God and protecting the animals."

Joseph J. Hobbs is professor of geography at the University of Missouri in Columbia. He is the author of two books published by University of Texas Press: Bedouin Life in the Egyptian Wilderness *(1989) and* Mount Sinai *(1995). He extends his special thanks to Mahmoud Mansour for his unfailing expertise and lasting friendship.*

Moonglow From Underground

Written by Tim Mackintosh-Smith

I live in a masterpiece. Sanaa, the capital of Yemen, is one of the most visually dramatic cities in the world. Its soaring houses—many, like mine, as high as seven stories—are of tawny mud brick banded by white plaster friezes and topped by dizzy parapets. "Sanaa," wrote a Yemeni poet in the ninth century, when the city was already considered ancient, "of the mansions and towers tall, high in antiquity, from time afore." Yet today, Sanaa is no museum exhibit: The brickmakers and masons, builders, joiners and plasterers are as busy as ever.

One craft, however, famous since pre-Islamic times, has almost disappeared: the cutting of alabaster windows. The windows are disappearing too, as more and more are replaced by glass, but if you wander around Sanaa at night, you can still glimpse a few, set high above the alleyways, diffusing subtle, enigmatic light.

No less enigmatic to me was how this alabaster got from under the ground into the window frames of Sanaani houses in the first place. With the help of an old friend, Hajj Abdullah al-Sayrafi, one of the few people left who know the process, and with a video cassette, I began to find out.

The video was a copy of the earliest known moving images of Yemen, filmed in 1937 by a French visitor, René Clément. As we watched, Hajj Abdullah gave a running commentary: "There's Bab al-Yaman...and the Cloth Suq.... Look! This is Suq al-Jabbanah, where we used to work, and—Stop!" I pressed the pause button as two men, caught in mid-stroke, sawed through a slab of alabaster. The film showed a world which, in many ways, remains unchanged: The crowds still press in the great *suqs*; the blacksmiths still squat by the furnaces, hammering, and the camel still turns the sesame press. But the alabaster cutters are gone. Hajj Abdullah gazed at the moment from his childhood. "That one might be Hajj Mushin al-Sayrafi, or al-Izzi. And Darwish used to work for us. But...I can't make them out. Of course, I was only a boy at the time."

At 63, Hajj Abdullah comes from the most famous family of alabaster cutters and merchants in Sanaa. He himself joined the business only a few years after the film was made. "It was hard work," he reminisced. "We used to start at dawn when it was cool, and we'd cut four panes before breakfast. And alabaster isn't like wood. It's uncooperative!" I pressed the play button again. The pair of figures working the two-man saw made the job look deceptively easy. With each long stroke, a shower of white dust fell, catching the sunlight.

The film came to an end. I looked out of the window into the night. Here, in the heart of Sanaa, the tall houses had melted into the darkness, but their lighted windows, mostly two rows on each floor, hovered in the gloom. Traditionally, the lower windows are glazed conventionally, while above them are other openings—arches, semicircles or pairs of circles one above the other. Most of the upper windows I could see were intricate traceries of plaster and colored glass; but a few shone with the dim, soft luminescence of alabaster, the color of clotted cream. The moon glowed overhead. Looking at it, it was easy to see how alabaster had got its Arabic name: *qamari*—moonstone.

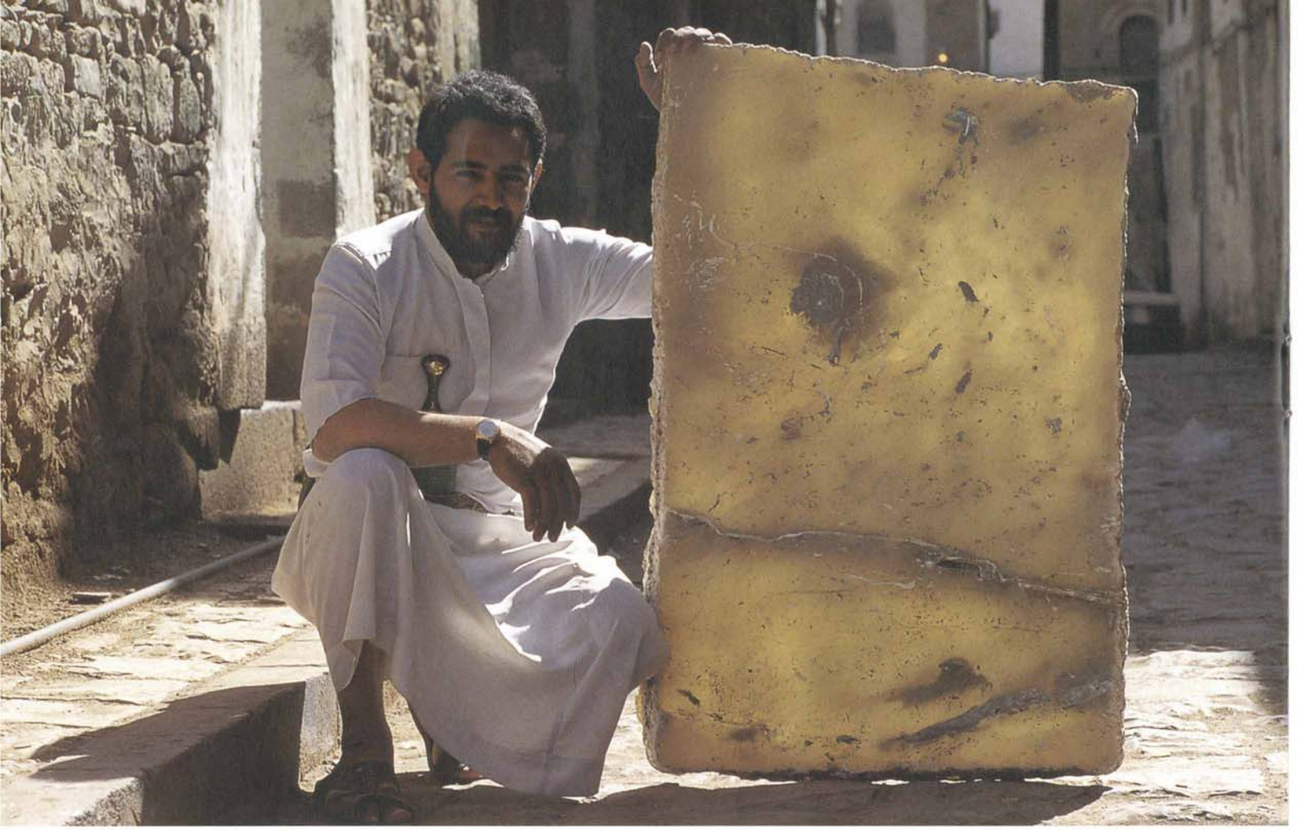
Exactly when the builders of Sanaa began to use alabaster for lighting is not known. The sculptors of the ancient Yemeni state of Saba were carving alabaster inscriptions and sculpture from at least the fifth century BC. (See *Aramco World*, March/April 1998.) It was Sabaean rulers who built the sumptuous skyscraper palace of Ghumdan in Sanaa some 1800 years ago. The 10th-century geographer, antiquarian and poet al-Hamdani described it:

> It rises, climbing into the midst of the sky,
> Twenty floors of no mean height,
> Wound with a turban of white cloud
> And girdled with alabaster.

The palace's most famous feature was a belvedere on the roof, surrounded by bronze lions and eagles that roared and screeched when the wind blew through them. It was roofed with a single panel of flawless alabaster. This ceiling was so translucent, the sources say, that you could tell crows from kites as they flew overhead. (Poetic license got the better of some writers, who claimed that Ghumdan's lights could be seen in the city of Madinah, 1200 kilometers [750 mi] distant.) Not to be outdone, the Ethiopians who occupied Yemen in the sixth century were said to have included a pane of alabaster 10 cubits (5m, 16') square in the dome of their cathedral.

Among Sanaa's traditional buildings, alabaster glazing was but one of scores of intricately artful, adaptive building techniques that made for comfort and beauty. ***Right:*** *Under the eye of the camera that recorded the first moving pictures of Yemen, craftsmen in Sanaa's al-Jabbanah market slice a slab of alabaster into translucent thicknesses. The slab is wedged into a braced, slotted tree stump. "Alabaster isn't like wood," says former craftsman Hajj Abdullah al-Sayrafi, "it's uncooperative!"* ***Opposite:*** *Alabaster both softened the harsh south Arabian sunlight and kept out dust long before glass was available.*

FROM TOP: RENÉ CLÉMENT, *L'ARABIE INTERDITE* (FORBIDDEN ARABIA), 1937; KEVIN RUSHBY; OPPOSITE: ERIC HANSEN



Top: Abdulwahhab ibn Muhammad al-Sayrafi, nephew of Hajj Abdullah, has begun a modest revival of his family's ancestral trade by supplying occasional alabaster window panes to architectural restoration projects in Sanaa. He does not, however, obtain his raw materials from the traditional family mine, ***above.***

Probably the earliest alabaster *in situ* is a mere stone's throw from the hummock which is all that remains of Ghumdan. Now blackened and plastered over on the outside, several panes in the ceiling of the Great Mosque originally illuminated the area around the *mihrab*, the niche showing the direction of prayer. They probably date from a reconstruction of the mosque during the caliphate of al-Walid, from 705 to 715.

Yet alabaster was hardly limited to palaces and mosques. Al-Hamdani, in his description of the Arabian Peninsula, writes of a typical Sanaani room under the heading *Wonders of Yemen to be Found in No Other Land*: "The alabaster panes transmit the sun's brightness to the pastured interior, which reflects its essence and its brilliance."

Alabaster was also set into the domes of bath houses, and a contemporary poet described bathing under "a sky with many moons." While window glass was still a luxury in Europe, Yemenis had found an answer to the problem of illumination—under the ground.

Curious to explore alabaster's subterranean origins, I persuaded Hajj Abdullah to take me to the al-Sayrafi family's mine, out on the road that leads to the ancient Sabaean capital, Marib. Half an hour out of Sanaa, we turned off the paved road and entered a small plain set between cliffs. Isolated hamlets and vineyards dotted the dusty landscape. After a short distance, we came to a line of mounds, recognizable as spoil heaps, up against a low hillside. The crumbly, dun-colored earth glittered with the crystalline fragments of alabaster. After some encouragement from Hajj Abdullah and Sa'id al-Uqbi, a local villager who used to work the mine, I clambered down into the mouth of one of the few shafts that remained open. Bent over under the low ceiling, I descended steeply for 10 meters (35'), until my way was blocked by a cave-in. Looking nervously at the roof of the tunnel, I felt the beginnings of claustrophobia and decided to continue my research at ground level.

"This shaft was one of the shorter ones," Sa'id told me as I brushed the dust off my clothes. "But it went down twice as deep as you got. Then it went straight into the hillside, following the alabaster seam." Alabaster, a type of fine-grained gypsum, occurs in thin layers sandwiched between strata of friable shale. Picture an ant trying to remove the icing from between the layers of a very heavy and crumbly cake—while leaving the cake itself intact—and you have an idea of what it is like to be an alabaster miner.

"When I reached the alabaster," Sa'id went on, "I'd follow the seam, digging out the shale above and below it. Other workers took the spoil to the surface. When I'd excavated a slab about three spans by five, I'd sit under it and chip through three edges where it was joined to the seam. Then, when the slab was completely free, I'd let it down onto my back and carry it up the shaft. We used to follow the seams many meters under the hillside, so it was a long way up to the ground." Since the slabs were around two inches thick and weighed at least 35 kilograms (80 lbs), it is hardly surprising that a skilled miner could extract no more than two a day. And the work was done by the light of a single, flickering kerosene lamp. I felt thoroughly ashamed of my claustrophobia.

The slabs were then carried to Sanaa by camel in sets of four, two placed on each side of the hump. It was at this point that the al-Sayrafis and their workmen took over. Hajj Abdullah took me through the cutting process. First, the shape of the panes required was marked out with a ruler and compass, and the slab cut to shape with a small saw. The next stage was to saw the slab vertically into three or four panes, each about one half to a full centimeter thick (3/10" to 4/10").

"Alabaster has a grain, like wood," Hajj Abdullah told me, "but you have to know how to find it. And different grades have different textures. The first grade, *sharifah* ("noble"), is the hardest to saw. But it has the finest color, like clarified butter."

Some panes, merely 15 by eight centimeters (6" x 3"), were used to light staircases; other were much larger, like the semicircular windows 125 centimeters across (50") that the al-Sayrafis made for the Dar al-Sa'adah, "The Palace of Felicity" completed by the Yemeni ruler Imam Yahya in 1923. But, while the shapes and sizes varied, I had noticed that alabaster is nearly always set in walls facing either east or west.

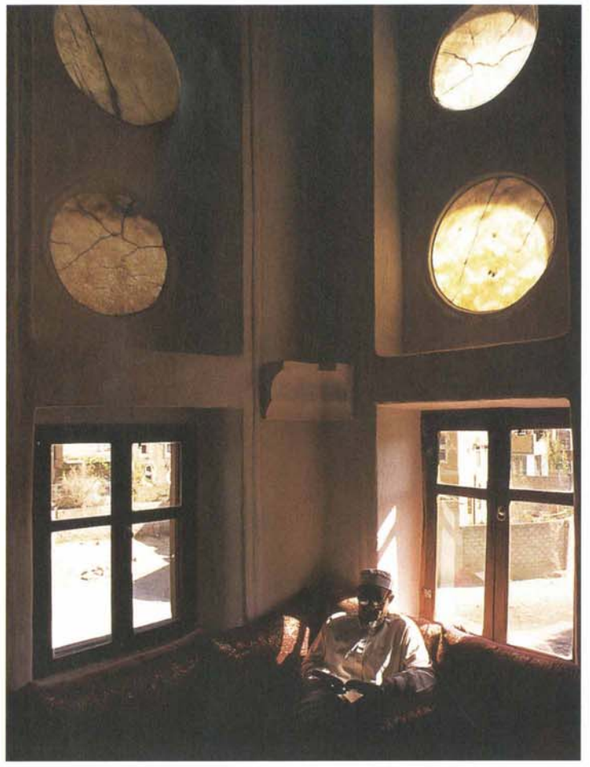
"That's because in the morning or the afternoon the sun is low in the sky, and the alabaster cuts out the dazzle," Hajj Abdullah explained. Rather like a polarizing lens, then, alabaster reflects the harsher rays of the sun, but apparently without reducing the amount of light entering the room. "And the strange thing about alabaster," he went on, "is that it seems to increase the light. I remember when my brother Muhammad put two new panes into our top room. I went into the room and said, 'Who lit the pressure lamp?'"

The problem with alabaster, however, is that it darkens and cracks with age, and turns to the color of old ivory, or caramel. The house-proud would renew their alabaster windows as often as every five years. As Yemen opened up to the international economy in the 1960's, a labor-intensive industry such as alabaster cutting was unable to compete with the newly available varieties of inexpensive glass. The al-Sayrafis turned to carpentry, and the moon-windows of Sanaa were eclipsed.

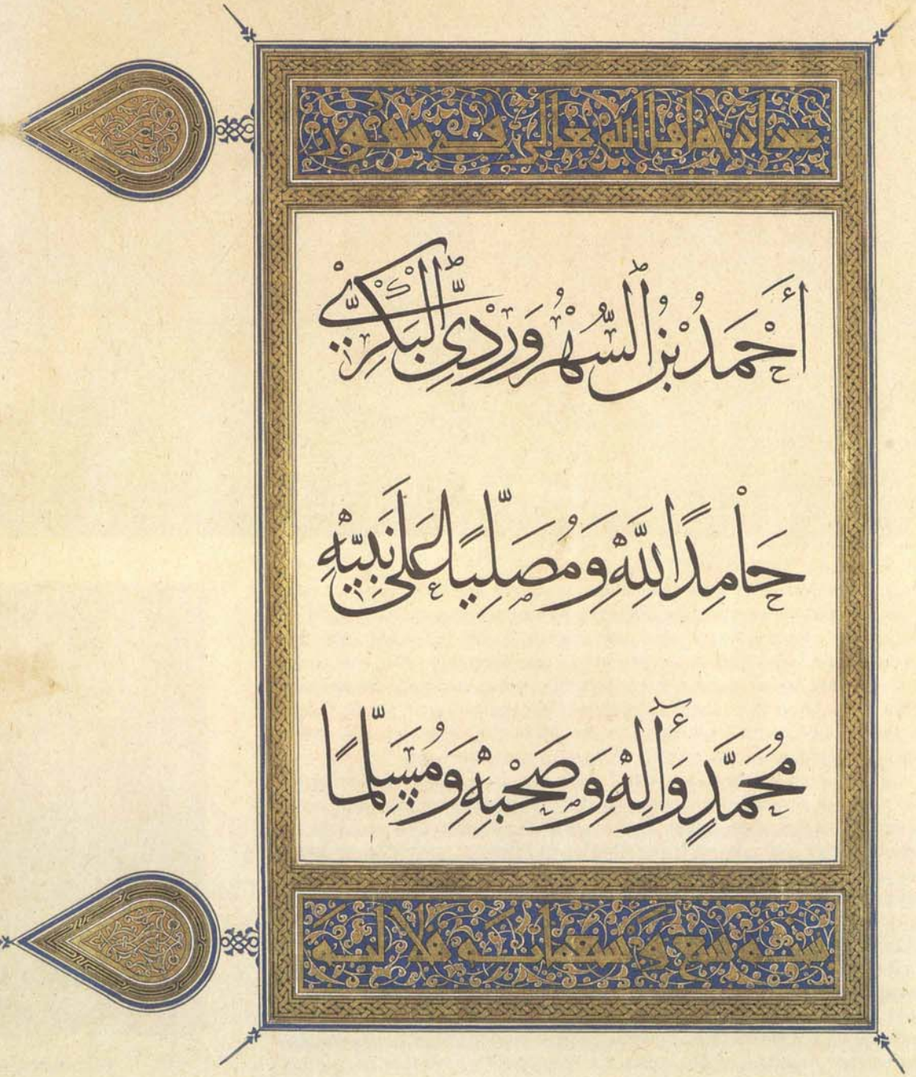
That night, I rewound the video for Hajj Abdullah and we watched the alabaster cutters again. The figures seemed almost balletic, moving with a lightness that belied the hard work. Once more, Hajj Abdullah tried to identify them, recalling names from his boyhood: Hajj Mushin, al-Izzi, al-Tawil, Darwish, al-Ghaythi. As I listened, I thought of the other men before them, now nameless, generations of alabaster cutters going back to the Sabaean builders of Ghumdan, the masters of a craft that has almost entirely disappeared.

Tim Mackintosh-Smith has lived in Yemen for 16 years. He is the author of Yemen: Travels in Dictionary Land *(1997, John Murray, 0-7195-5622-8), which won the 1998 Thomas Cook/*Daily Telegraph *Travel Book Award. It will be published this year in the US by Overlook Press.*

PETER SANDERS (2); OPPOSITE: KEVIN RUSHBY (2)



Top: *Some of the grander houses in Old Sanaa use glass at the bottom to afford a view, and alabaster above the glass to softly brighten high-ceilinged rooms.*
Above: *The exteriors of such houses use plaster-and-gypsum tracery to frame the round alabaster windows.*



Revolution by the Ream

A History of Paper

WRITTEN BY JONATHAN M. BLOOM

2ND CENTURY BC

•••

Central China

Samarkand

Baghdad

Damascus

Cairo

Kairouan

Fez

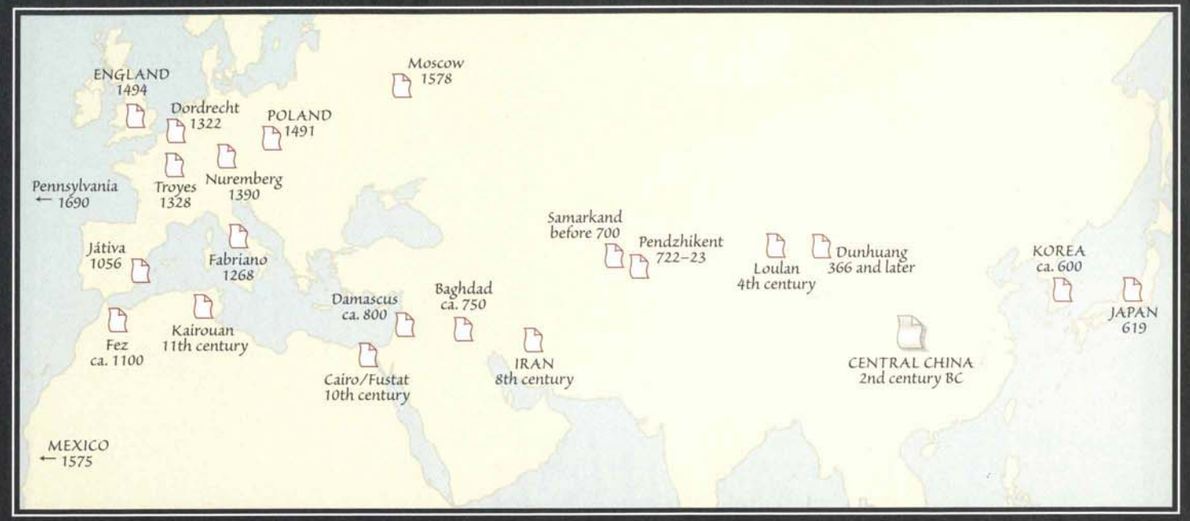
Játiva

Fabriano

Nuremberg

•••

14TH CENTURY



The Paper Trail

Mercantile and missionary traffic carried knowledge of paper and its manufacture eastward and westward from its Chinese origins in a journey that took more than a millennium. From Central Asia, Muslim merchants spread it to the Middle East and North Africa, from where it crossed the Mediterranean in the 11th century.

Paper, one of the most ubiquitous materials in modern life, was invented in China more than 2000 years ago. Nearly a millennium passed, however, before Europeans first used it, and they only began to manufacture it in the 11th and 12th centuries, after Muslims had established the first paper mills in Spain. The German Ulman Stromer, who had seen paper mills in Italy, built the first one north of the Alps at Nuremberg in the late 14th century.

The cultural revolution begun by Johann Gutenberg's printing press in 15th-century Mainz could not have taken place without paper mills like Stromer's, for even the earliest printing presses produced books at many times the speed of hand copyists, and had to be fed with reams and reams of paper. Our demand for paper has never been satisfied since, for we constantly develop new uses for this versatile material and new sources for the fiber from which it is made. Even today, despite the computer's promise to provide us with "paperless offices," we all use more paper than ever before, not only for communication, but also for wrapping, filtering, construction and hundreds of other purposes.

How did paper get from China to Europe? Soon after its invention, Chinese merchants and missionaries transmitted paper, and knowledge of papermaking, to neighboring lands such as Japan, Korea, and Central Asia. It was there that Muslims first encountered it in the eighth century. Islamic civilization spread knowledge of paper and papermaking to Iraq, Syria, Egypt, North Africa and, finally, Spain. This pivotal role is evident in the way we still count paper in units—today they are units of 500 sheets—called reams. That word came into English via the Old French *rayme* from Spanish *resma*, which in turn comes from the Arabic *rizmah*, meaning a bale or bundle.

Most accounts of the history of paper focus either on its origins in China or its development in Europe, and simply ignore the centuries when knowledge of paper and papermaking spread throughout the Islamic lands. Some of this neglect is due to the difficulty of studying Islamic paper, since Islamic papers, unlike later European papers, do not have watermarks (see sidebar, p. 30) and are consequently very difficult to localize and date. Nevertheless, the diffusion of paper and papermaking skill in the Islamic world in the period between the eighth and the 14th centuries wrought enormous changes in such diverse realms as literature, mathematics, commerce and the arts, just as printing with moveable type spurred a conceptual revolution whose effects are still being felt today.

Europeans long debated the origins of paper. Until relatively recently, most people thought that paper derived from papyrus (see sidebar, p. 32) or that Europeans or Arabs had invented it. Indeed, the word *paper*, attested in English since the 14th century, does derive, via Old French and Spanish, from the Latin word *papyrus*.

Previous spread: *By the 14th century, Baghdad's papermakers had developed techniques for manufacturing large, polished sheets. This made possible the production of copies of the Qur'an of unprecedented size, such as the magnificent 30-volume manuscript from which this 500-by-350-millimeter (20"x14") page was taken. The texts at top and bottom refer respectively to the chapters included in the volume and the year of the work's completion, 1307. The center inscription is the calligrapher's colophon: "Ahmad ibn al-Suhrawardi al-Bakri, who thanks God and sends prayers and greetings to the Prophet Muhammad, his family and companions."*

Medieval Muslims, on the other hand, knew that paper came from China. As early as the 11th century, the Arab historian 'Abd al-Malik al-Tha'alibi, enumerating the specialties of different lands in his *Book of Curious and Entertaining Information*, says that "paper is among the specialties of Samarkand, and it looks better and is more supple, more easily handled, and more convenient for writing than papyrus and parchment," the two major writing materials known in antiquity. According to al-Tha'alibi, Chinese prisoners captured by the Arab commander Ziyad ibn Salih introduced papermaking to Samarkand after the battle of Talas in 751. (See *Aramco World*, September/October 1982.) "Then paper was manufactured on a wide scale and passed into general use, until it became an important export commodity for the people of Samarkand," al-Tha'alibi wrote. "Its value was universally recognized and people everywhere used it."

Whether or not one takes al-Tha'alibi's account at face value, paper was undoubtedly introduced to the Middle East through Central Asia. Specimens of very old paper have been discovered at various sites in eastern Central Asia, where the extreme dryness of the climate helped preserve them. In 1900, a Chinese Buddhist monk accidentally discovered more than 30,000 paper scrolls in a cave at Dunhuang, in China's Gansu province. As the cave was first used in 366 and was sealed in the 10th century, the papers—comprising Buddhist, Taoist and Confucian texts, government documents, business contracts, calendars, and miscellaneous exercises written in Chinese, Sanskrit, Soghdian, Iranian, Uighur and Tibetan—must date from this six-century period. In 1907, the British explorer Sir Aurel Stein discovered a group of Soghdian paper documents in a ruined watchtower between Dunhuang and Loulan, farther west. They comprised five almost complete letters and several fragments. The letters, dating from between the fourth and sixth centuries, were found in a refuse heap, and probably represent the contents of a lost or abandoned mailbag. One of the letters was wrapped in silk and enclosed in a coarse cloth envelope addressed to Samarkand, which lay about 2000 miles farther west. The find shows that paper was used by Silk Road merchants throughout the oasis cities of Central Asia even before the coming of Islam.

In 1933, Soviet scholars found several paper documents among 76 Soghdian, Arabic and Chinese texts discovered at Mount Mug, the mountain stronghold, near Pendzhikent in Tajikistan, where Devastich, lord of Panch, had attempted to escape from the Arab invaders in 722–723, some three decades before the battle of Talas ①. Pendzhikent, just east of Samarkand, is only 500 kilometers (300 mi) from Talas.

This Central Asian diffusion route is confirmed by the first Arabic word for paper, *kaghad*, and by the Turkish word, *kâğıt*, used to this day. Both derive from Soghdian and Uighur words, which themselves derive from the Chinese word *gu-zhi*, "paper made from paper-mulberry bark." *Qirtas*, another early Arabic word for paper, was borrowed from the Greek *chartes* and initially referred to papyrus,

① *Early eighth-century Arabic paper documents found in 1933 by Soviet scholars at Mount Mug, in present-day Tajikistan, helped trace the route and the timing of paper's westward diffusion from China.*

INSTITUTE OF ORIENTAL STUDIES (ST. PETERSBURG); PREVIOUS SPREAD: METROPOLITAN MUSEUM OF ART

papyrus rolls and parchment. *Qirtas* appears in this sense in the Qur'an (Sura 6, "Cattle," verses 7 and 91) with reference to writings on separate sheets. Perhaps the most common Arabic word for paper—and the one in use today—came to be *waraq*, literally meaning "foliage" or "leaves," probably as a short form of the expression *waraq qirtas*, "a leaf of paper." Other words derived from *waraq* are *waraqa* ("a sheet of paper"), *warraaq* ("stationer," "papermaker," "paper merchant" and, by extension, "copyist") and *wiraaqa* ("papermaking"), as well as many compound expressions referring to paper money, lottery tickets, commercial papers, banknotes and such.

By the reign of the Abbasid caliph Harun al-Rashid (786–809), enough paper was available in Baghdad for bureaucrats to use it for record-keeping instead of papyrus and parchment. According to the great 14th-century North African historian and philosopher Ibn Khaldun, the vizier al-Fadl ibn Yahya introduced the manufacture of paper to Baghdad when parchment was in short supply and he needed more writing materials. The vizier, whose family came from Balkh, now in northern Afghanistan, was probably familiar with paper from his youth. "Thus," Ibn Khaldun writes, "paper came to be used for government documents and diplomas. Afterward, people used paper in sheets for government and scholarly writings, and the manufacture [of paper] reached a considerable degree of excellence." Ibn Khaldun did not mention one of the greatest advantages of paper: Since it absorbed ink, writing could not easily be erased from it, as it could from papyrus and parchment. Documents written on paper were therefore more secure from forgery.

Papermaking and stationery were soon significant businesses in Baghdad. Ahmad ibn Abi Tahir (819–893), the teacher, writer, and paper dealer, was established at the Suq al-Warraqin (the Stationers' Market), a street which was lined with more than 100 paper- and booksellers' shops. Stationers in Abbasid Baghdad must have functioned somewhat like private research libraries, for the ninth-century polymath al-Jahiz is said to have rented stationers' shops by the day in order to read the books they kept in stock. Another famous stationer was Abu'l-Faraj Muhammad ibn Ishaq (d. 995), known also as Ibn Abi Ya'qub al-Nadim al-Warraq ("the Stationer"). He used his extensive professional knowledge to compile the *Fihrist*, an encyclopaedia which remains a mine of information about medieval books and writing.

The new availability of paper in the ninth century spurred an extraordinary burst of literary creativity in virtually all subjects, from theology to the natural sciences and belles-lettres. Religious scholars collected and codified the traditions (*hadith*) of the Prophet, which had been preserved orally following his death in 632, and committed them to ink and paper. New types of literature, such as cookbooks and the tales we know as *The Thousand and One Nights*, were copied on paper for sale to interested readers. Although earlier caliphs had maintained libraries, it was Harun's son and successor al-Ma'mun (813–833) who enlarged the caliphal library, which came to be known as the *bayt al-hikmah*, or "house of knowledge." (See *Aramco World*,

In this modern depiction of an early Chinese paper mill, strips of mulberry bark are scraped (left) and then chopped (background right). The pieces are then pounded into pulp with a counter-weighted step-hammer (background center) and the pulp is stirred into a water-filled vat. The single-screen moulds were hand-dipped, and the resulting sheets were dried under pressure (foreground). ***Below:*** *A Chinese paper mould dating to the first century.*

Paper in One Paragraph

Paper owes its distinctive strength and flexibility to the way the cellulose fibers it is made of are chemically and physically bound together in the papermaking process. In traditional papermaking, the cellulose fibers are extracted from plants, or from rags made from plant fibers, and then beaten in water to make the fibers swell and bond together into a pulp. This pulp is suspended in water, and a mat of it is then collected on a screen and drained. As the mat dries, the fibers physically intertwine and the microfibrils form physical and chemical links with each other. Paper sheets were at first formed with a floating screen, a primitive type of mould made from a woven cloth stretched on a frame onto which the pulp was poured. The pulp remained on the screen until the sheet was dry. The two-piece mould, in which the screen could be separated from the frame and which was lowered vertically into the vat containing the macerated fibers and then raised horizontally, marked a major advance in papermaking. It allowed the just-formed sheet of paper to be removed from the mould while still moist. Other sheets could then be formed in the mould while the first sheet dried. Moulds were traditionally made of smooth bamboo or flax fibers (or, in Europe, of thin brass wire) held parallel by cross-ties of silk, flax, hair or wire. Whatever the materials, paper made with this type of screen generally displays a distinctive pattern of faint parallel lines called "laid lines," and European papermakers quickly discovered that they could weave designs into the screen which would leave faint "watermarks" in the finished paper.

May/June 1982, March/April 1987.) Scholars and copyists translated Greek texts, written on parchment and papyrus, into Arabic, transcribing them onto sheets of paper which were then bound into books.

The new availability of paper also encouraged new approaches to old subjects. At the same time that paper was being disseminated across the Islamic lands, the Hindu system of reckoning with decimal place-value numerals—what we call "Arabic numerals"—was spreading westward from India. Before the Hindu system was introduced, people in the Islamic lands, as elsewhere, did their calculations mentally and recorded intermediate results either on a dust-board—which could be repeatedly erased as they performed successive additions or subtractions—or by the position of their fingers ("finger-reckoning"). The first manual of Hindu reckoning in Arabic was written by Muhammad ibn Musa al-Khwarizmi (ca. 825), whose name has given us our word *algorithm,* meaning the sequence of steps followed to solve a type of problem. According to al-Khwarizmi's treatise, the fundamental arithmetic operations are performed by placing the numbers one above the other; the process begins on the left. Numbers are erased and shifted, clearly implying that the operations were still meant to be performed on a dust-board. A century later, however, the mathematician Abu al-Hasan Ahmad ibn Ibrahim al-Uqlidisi ("the Euclidian") altered the Indian scheme of calculation in his mathematical treatise, composed at Damascus in 952–953, to suit the use of ink and paper. Although al-Uqlidisi's scheme allowed neither shifting nor erasure of numbers—not possible on paper—it did permit far greater flexibility in calculation.

A Greek manuscript now in the Vatican library is believed to be the oldest surviving manuscript written on Arab paper. Consisting of a miscellaneous assemblage of the teachings of Christian church fathers, the manuscript was probably copied at Damascus in about 800, and shows that the use of paper was not limited to the Muslim bureaucracy in Baghdad. It was used also by Christians living under Muslim rule in Syria, a community instrumental in the great translation projects of the time.

Another early paper fragment shows that paper encouraged the copying and transmission of new types of literature. Discovered in Egypt, and now in the collection of the Oriental Institute in Chicago, it is a damaged, folded sheet ② of light brown paper made from linen fibers. It contains the title and the beginning of the text of the earliest known copy of *The Thousand and One Nights,* as well as several other phrases, texts and a drawing. The arrangement of the writing indicates that the original sheet once formed the first two pages of a manuscript. It had become waste paper by late 879, when a certain Ahmad ibn Mahfuz practiced writing out legal formulas in the margins of all four pages. Because writers in Egypt continued to use papyrus throughout the ninth century, the great Arabic scholar Nabia Abbott ascribed the fragment to Syria and the first quarter of the ninth century, about the same time and place as the Vatican manuscript.

② *In 879, one Ahmad ibn Mahfuz, the owner of what is today the earliest known fragment of* Alf Laylah wa Laylah (The Thousand and One Nights), *used the scrap to practice writing legal formulas—and his own name. The book's title page is to the left of the fold.*

Al-Uqlidisi's new calculation techniques, published around 950, clearly assume the use of paper and ink instead of the familiar dust-board.

The oldest surviving dated book copied in Arabic script on paper is generally believed to be a fragment of Abu 'Ubayd al-Qasim ibn Sallam's work on unusual terms in the traditions of the Prophet ③. Preserved in the Leiden University Library, and dated to November or December of 866, the manuscript is on dark brown, opaque, stiff paper; it is strong, of medium thickness, and has clearly undergone some polishing on both sides. Thus, we know that paper was used in the Islamic lands for Christian, secular, and theological manuscripts at least from the ninth century.

There seems, however, to have been some resistance to using this new material for transcribing the Qur'an, the most important and popular book in the Islamic lands, which was normally copied on leaves of parchment. Parchment is made from the wetted,

This Italian rendering of a stand of papyrus reeds at Siracusa is painted on a sheet of papyrus. Though the plant grew all around the Mediterranean, papyrus-making was largely restricted to Egypt because, away from the Nile, the plant rarely grew stems thick enough for the purpose.

Papyrus in Two

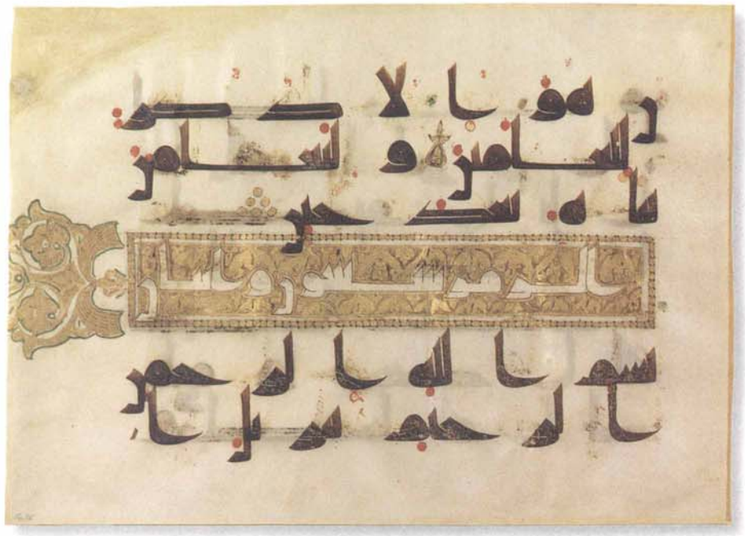
The papyrus plant (*Cyperus papyrus*; its name is the ultimate source of our word *paper*) is a member of the sedge family which once grew throughout the uncultivated marshes of the Nile. In Egypt, the plant could grow to a height of five meters (16') and its stems reach a thickness of five centimeters (2"), but under less ideal conditions the plant yields only modest stems, so that the manufacture of papyrus was essentially an Egyptian industry. By the 19th century increased cultivation had destroyed the reed's native habitat, and it had died out in the Nile Valley, although it still flourished in the Sudan. The papyrus strain currently grown in Egypt was introduced in 1872 from the Jardin des Plantes in Paris.

The first-century Roman writer Pliny the Elder described the manufacture of papyrus sheets in his *Natural History*, although his description is difficult to follow and has given rise to varied interpretations. Surviving papyri, however, give some indication of how sheets of writing material were prepared from the plant. (See *Aramco World*, July/August 1973.)

The papyrus stems were cut into manageable lengths and the outer layer removed from the pith. The pith was then sliced or peeled into very thin strips, normally one to three centimeters wide (⅜"–1¼"). The resulting strips could be used immediately or dried and stored, in which case the strips were soaked until the fibers loosened. In either case, the strips were then laid parallel, one by one, on a smooth surface, just touching or slightly overlapping each other. Another similar layer, with its strips running at right angles to the first, was laid on top. Pressing or hammering brought the strips together, and the fibers of the two layers intertwined. The whole thus dried into a strong and flexible sheet. Papyrus sheets were pasted end to end with flour paste to form a roll, normally about 20 sheets long. The plant juices remaining in the sheet functioned as a natural sizing, barely allowing carbon ink to penetrate the surface, and erasures could thus be made by wiping or washing away the wet ink, or by using a stone eraser to abrade the dried surface.

③ *The oldest surviving dated book written in Arabic on paper is this partial copy of the grammatical work* Kitab Gharib al-Hadith (The Book of Linguistic Difficulties in the Traditions of the Prophet), *completed in late 866.*

④ *The sanctity of the holy book and the respect accorded its earthly copies meant that the Qur'an continued to be transcribed on expensive parchment, often in the traditional bold Kufic script, well after paper became widely available.*



stretched and scraped skins of sheep and goats; it is strong and durable, but expensive to make, for, in addition to the labor of preparing it, the animal must be killed to get its skin ⑤. Eventually paper triumphed as a writing material and, at the same time, the majestic Kufic scripts developed for writing on parchment ④ gave way to angular "new style" and then more flowing, or cursive, styles of writing. In addition, the typical book format changed from horizontal to vertical. The oldest surviving dated Qur'an manuscript on paper was copied by the calligrapher 'Ali ibn Sadan al-Razi in 971–972. The remains of this four-volume, vertical-format manuscript are divided among Ardabil in Iran, the Istanbul University Library, and the Chester Beatty Library in Dublin ⑥. Another paper manuscript of the Qur'an, copied at Isfahan in 993, retains the large horizontal format of parchment manuscripts.

Perhaps the most famous early paper manuscript of the Qur'an is that copied in 1000–1001 by 'Ali ibn Hilal, known as Ibn al-Bawwab, who was then the leading calligrapher of Baghdad. It is a small volume containing 286 folios, each page bearing 15 lines of a rounded *nakshi* hand, the type of script that made Ibn al-Bawwab so famous. The absence of a dedication, combined with the small size and single-volume format, suggest that Ibn al-Bawwab copied this manuscript not as a specific commission but in the hope of selling it on the market.

By the late 10th century, paper had entirely supplanted papyrus, which had been used uninterruptedly in Egypt for four millennia. Despite the introduction of parchment in Roman times, papyrus had retained its importance throughout Egypt's Greek, Roman and early Islamic periods for letters and documents, as well as for copying literary works. Surviving documents and Arabic sources indicate that papyrus was still made in Egypt during the early Islamic period for local and foreign consumers, such as local governors and the Byzantine and papal chanceries. But from the early ninth century, paper became increasingly important. Writing in 956, the historian al-Mas'udi indicated that papyrus manufacture was not completely defunct in Egypt, but the geographer Ibn Hawqal, who visited Egypt some 40 years later, made no reference to its use as a writing material. And by 985–986, according to the Palestinian geographer al-Muqaddasi, paper had become one of Egypt's major products. The Persian traveler Nasir-i Khusraw, who visited Cairo between 1035 and 1042, mentions that in the bazaars of Fustat (Old Cairo), the greengrocers, grocers and mercers provided free containers to hold or wrap the glassware, ceramics, and bundles of paper they

⑤ *To make parchment, goat or sheep skin is wetted, stretched and scraped repeatedly. The word probably derives from the name of the Greek city of Pergamon (now Bergama, Turkey), where the techniques that allowed utilization of both sides of the skin were developed in the second century* BC.

⑥ *The oldest surviving dated copy of the Qur'an on paper is a four-volume work written in "bent" Kufic script, the pages laid out in vertical format, that was copied by 'Ali ibn Sadan al-Razi in 972.*

sold. This suggests that paper had become relatively cheap, although it still wasn't so cheap that it was easily discarded. Used paper was saved so that the fiber could be recycled into new paper.

Like Central Asia's, the extremely dry climate of Egypt is ideal for preserving organic materials, and several great caches of ancient papyri and medieval papers were discovered there in the 19th century. In 1877 archaeologists found more than 100,000 papyrus and paper documents at Akhmim, Arsinoë, and Ashmunayn, including important historical and economic documents from the Islamic period. Most were acquired by Archduke Rainer of Austria in 1884 and formed the basis of the great Vienna Papyrus Collection at the Nationalbibliothek. At approximately the same time, workmen discovered some 300,000 more documents, dating mainly from the mid-10th to the mid-13th centuries, in a storeroom (known in Hebrew as a *geniza)* of the Palestinian Synagogue in Fustat. The geniza documents include trousseau lists, commercial documents and personal letters relating to the Jewish community; they had been placed in the storeroom in anticipation of proper disposal, but were forgotten for centuries ⑦. Mostly in Judeo-Arabic—colloquial Arabic written in Hebrew characters—they have become an essential source for reconstructing daily and economic life in the medieval Islamic lands, as well as for the history of spoken Arabic. They also show how paper had become an indispensable medium of communication in this commercial society, where bills of exchange, orders of payment, and similar documents, most of them written on paper, were regularly sent back and forth between trading communities located as far apart as Spain and India.

The Zirid prince al-Mu'izz ibn Badis, who ruled in what is now Tunisia and eastern Algeria from 1016 to 1062, included a brief account of medieval papermaking in his book, *'Umdat al-Kuttab (The Support of Scribes),* the only medieval work on the arts of the book to survive. However, the process of making paper from raw flax on a floating screen, as Ibn Badis described in detail, had been superseded for centuries throughout the Islamic lands, where papermakers had adopted more advanced techniques, using waste rags and old rope as the primary source of fiber, and dipping the paper mould in a large vat of pulp suspended in water. It is possible that Ibn Badis's sources did not wish to share the real secrets of papermaking with him. The rest of his account refers to the sizing of paper with equal quantities of chalk and starch, or with rice starch, and dyeing paper different colors.

Oddly enough, the one manuscript known to have been copied and illuminated during Ibn Badis's lifetime is a copy of the Qur'an transcribed on parchment, not paper, in 1020. According to the Geniza documents, Tunisia and Sicily were great centers for leather production, and private letters and documents from that region were still written on parchment well into the 11th century. But papermaking nonetheless spread

⑦ *Nearly all of the approximately 200,000 medieval documents found in 1896 in the* geniza *of the Palestinian Synagogue in Fustat (Old Cairo) were written on paper; they are evidence of the wide availability of inexpensive paper in the Islamic lands. Many were written in Arabic using the Hebrew alphabet, like this letter of thanks.*

ROBERT C. WILLIAMS AMERICAN MUSEUM OF PAPERMAKING; OPPOSITE, TOP: CHESTER BEATTY LIBRARY; BOTTOM: FREER GALLERY OF ART/SMITHSONIAN INSTITUTION

throughout North Africa and Spain. Fez was already an important papermaking center in the 11th century, with 400 paper mills reported by the end of the 12th century, and the first Spanish paper mill is documented at Játiva in 1056. Here too there seems to have been some reluctance to use paper for manuscripts of the Qur'an, even after it had become acceptable in the east. Paper manuscripts of the Qur'an began to appear in the western Islamic world in the 13th century, but parchment ones continued to be produced well into the 14th century.

Ibn Badis' description of colored papers is confirmed by North African documents surviving in European archives, where some are on papers varying in color from red or vermilion to purple or pale pink. These documents are known by the generic term *nasri,* after the Nasrid dynasty of southern Spain, which ruled from the Alhambra in Granada. (See *Aramco World*, March/April 1999.) Perhaps the most striking example is in the Aragonese archives, a blood-red paper made of linen and hemp. Its text is a furious letter written in 1418 by Muhammad VIII of Granada to Alfonso V, protesting that his representative at Alfonso's court had arrogated undue powers to himself; the vivid color may have been intentionally chosen to symbolize the wrath of the writer.

By the mid-14th century, North African chanceries had begun to use Western papers.

Paper began to be used in Italy at the very end of the 11th century, first in Sicily, where the Normans followed Arab custom, and then in the northern trading cities. In the first half of the 13th century some paper was briefly made near Genoa, probably following Spanish techniques, but the major center of Italian paper manufacture developed after 1276 at Fabriano, in central Italy ⑧. The Europeans' ability to harness water power to run paper mills made their product cheaper, if not initially better, than that available in North Africa and Egypt, and imported Italian paper soon began to supplant local production in North Africa and Spain. By the mid-14th century, North African chanceries had begun to use Western papers. A letter dated December 8, 1350 from the Sultan of Tunis to King Peter IV of Aragon-Catalonia is on

⑧ *The technology used in Pietro Miliani's paper mill at Fabriano in the middle of the 15th century was not dramatically different from that used in China 16 centuries earlier.*

⑨ *This is the first copy of the Qur'an known to have been produced in the Islamic world—possibly in Iraq—using European-made paper. The watermark indicates that the sheets were made near Venice in the early 1340's, shortly before the Jalayirid sultan Uvays granted Genoese and Venetian merchants trading rights in his territories in present-day Iraq and Iran. The zig-zag continuation of the text in the margins of the page may have been an effort to economize on imported paper.*

paper bearing a griffin watermark, which shows that it had been exported from Italy. At much the same time, Egyptian papermakers also began to face serious competition. In addition to better-quality papers from Fabriano and Treviso, cheap papers "of the worst kind"—in the estimation of the 14th-century Egyptian writer al-Qalqashandi—were also imported. Although some paper continued to be made in Egypt until the 17th century, French and Italian papers were dominant in Egypt from the 16th century.

European papers also began to make their way east, although they faced stiffer competition from the local product there. A single-volume manuscript of the Qur'an in the Nour Collection ⑨, for example, was transcribed on Italian paper datable to the 1340's. Heavily watermarked with a double-key design surmounted by a cross, the paper is almost identical to examples from Arezzo and Torcello near Venice. The European paper confirms that Genoese and Venetian merchants like Marco Polo had carried Italian goods, including paper, to Iraq and Iran, where they may have traded them for carpets, silks, and spices to bring home.

The appearance of European paper at this date in Iran and Iraq, in contrast to North Africa and Egypt, is all the more surprising because local production was then at its apogee. From the 13th century, the availability of large sheets of locally manufactured fine white paper in Iran had spurred a second revolution in the Islamic book, the effects of which would continue to be felt for another two centuries there and in Egypt, India and the Ottoman Empire. Before the 13th century, most books written on paper had usually been small, normally no bigger than a sheet of modern office paper, implying that the sheet of paper from which they had been made was about twice as large. A sheet of this size was made in a mould that could easily be held in the papermaker's hands. Larger sheets of paper were more difficult to make and consequently too expensive to use freely. Even when caliphs and sultans needed long scrolls for documents and decrees, they were made from smaller sheets pasted together.

From the 13th century, however, the size and quality of paper available in Iran for books and other uses increased dramatically, but the causes of these changes are not immediately apparent. One possibility is increased contact with China—where papermaking techniques had continued to develop—during the period when Mongol dynasties ruled China, Central Asia, Southern Russia, Iran, and much of the Middle East. (The Mongol rulers of Iran briefly, and disastrously, introduced printed paper currency there in 1294.) It is also possible that techniques for grinding and processing the pulp improved. Whatever the causes, the results of this change can be seen in the great number of large luxury volumes that have survived from this period.

As always, the Qur'an continued to be the most important and popular text, and famed calligraphers penned splendid large copies. Ahmad al-Suhrawardi, for example, completed transcribing a 30-volume copy of the Qur'an at Baghdad in 1307 (see p. 26). The pages measure 500 by 350 millimeters (19 11/16" x 13 3/4"), implying a sheet size of at least 500 by 700 millimeters (19 11/16" x 27 1/2"). The brilliant white paper was beautifully sized and polished so the calligrapher's pen

Larger sheets of paper allowed larger and more monumental examples of the calligrapher's art, but also allowed use of more and larger illustrations.

BIBLIOTHECA ALBERTINA/UNIVERSITY OF LEIPZIG; OPPOSITE: NASSER D. KHALILI COLLECTION OF ISLAMIC ART

was able to glide effortlessly over its smooth surface. Even larger is the dispersed 30-part manuscript of the Qur'an copied for the Mongol sultan Öljeitü between 1306 and 1309 and bequeathed to his mausoleum at Sultaniyya ⑩. The pages measure a whopping 720 by 500 millimeters (28 11/32" x 19 11/16"), implying that the sheets of paper from which the folios were made measured approximately 1100 millimeters (43 1/4") in their long dimension. The manuscript has only five lines of text per page, so the entire set of 30 volumes would have comprised over 2000 folios. Monumental calligraphy was indeed appropriate for a volume meant to be read publicly in a mosque.

Larger sheets of paper allowed larger and more monumental examples of the calligrapher's art, but they also allowed production of books with increased numbers of larger illustrations, and from the early 14th century the illustrated book became a major form of art in the Islamic world. In previous centuries several types of books had been illustrated with relatively small drawings and paintings to clarify specific points in the text. Thus, books on astronomy would have been practically useless without small diagrams of the constellations, and books on pharmacology might have been dangerous without small illustrations of the useful plants the author discussed. In the 13th century, a few literary works began to be illustrated, but in the 14th century larger books, such as Rashid al-Din's *Compendium of Chronicles*—the first truly universal history of the world—and the great copy of the *Shahnamah* (*The Book of Kings*), the so-called Great Mongol Shahnahmah, copied for the Ilkhanid rulers ⑪, were prepared with paintings as large as 250 millimeters (10") on a side. In contrast to earlier illustrations, these images do not simply illustrate the text but also elaborate on it in new and dif-

⑩ *This page is one of some 2000 similarly ornate folios that comprise a 30-part copy of the Qur'an produced in Baghdad for the Mongol sultan Öljeitü in 1306 or 1307.*

⑪ *The paintings included in the "Great Mongol Shahnamah," a large-format, 14th-century manuscript of the* Book of Kings, *were among the first to go beyond mere ornamentation of a narrative text to elaboration of it. Some scholars attribute a political subtext to the illustrations and see the manuscript as a work of propaganda intended to legitimate Mongol rule of Persia.*

Designs once stored in the craftsman's head were now increasingly fixed on paper. The artist and artisan might now be different people, and designs in one medium could now be used in another.

⑫ *Among the earliest examples of woodblock printing in the Islamic world is this fragment of an inexpensive amulet from 11th- or 12th-century Cairo. Printing with movable type, however, faced two hurdles in the Arabic-speaking world. A complete font of Arabic type required more than twice as many pieces as a European font; and the very great value placed on writing in the Arab world set standards of technical and esthetic perfection that moveable type could not fully meet.*

ferent ways, using complex and deep landscapes and facial expression and gesture to portray human emotions. (See *Aramco World*, July/August 1997.) Although such paintings are called "Persian miniatures" today, in their own time they must have seemed quite monumental. Persian painters did not continue to use these pictorial devices in later centuries, but the ideal of the luxury book copied on large sheets of exquisite paper lived on for generations.

The increased availability of paper from the 13th century also spurred another artistic revolution in the Islamic lands. Architects and artists began to take advantage of the medium to work out designs before the work of art was actually executed, and for transmitting designs from one place to another. The most obvious new role for paper was in architectural plans.

Builders in antiquity had, of course, sometimes used plans and drawings, and there are occasional references to plans in the first seven centuries of Islam, but most construction was based on empirical knowledge transmitted by the spoken word, by gesture, and by memory from one builder to another and from one site to another. From the 14th century, however, builders in the Islamic lands increasingly took advantage of plans and drawings to supplement their traditional skills. Within each cultural orbit, the result was an increased uniformity in architecture, as the new method of representing architecture allowed someone working in the capital to design a building for a provincial city he might never have visited. The clearest example of this new approach comes from the Ottoman Empire, where, after the conquest of Constantinople in 1453, the office of the chief court architect in Istanbul became responsible for designing buildings, bridges, and aqueducts for sites throughout the realm, to be constructed by local workmen. Ottoman architects were thereby able to achieve an impressive uniformity in their work, and the Ottoman presence in a particular region was immediately visible as hemispheric lead-covered domes and pencil-thin minarets defined the skyline.

The increased availability of paper in the Islamic lands also spurred a change in the other arts, such as metalwork, ceramics and particularly textiles, as artists increasingly created designs on paper that artisans applied to their work. In traditional craft practice throughout the first centuries of Islam, the artisan had also been the designer, working out the design of the finished piece from memory or creating it as he or she went along. A metalworker, for example, would draw out the design on a brass tray before scraping away parts to be inlaid. A potter might practice his decorating on the backs of tiles before beginning to decorate an important plate, but the design on the finished piece came out of his head. A weaver would pattern her carpet with designs she had learned as a child from her mother, never with ones she had seen in a book.

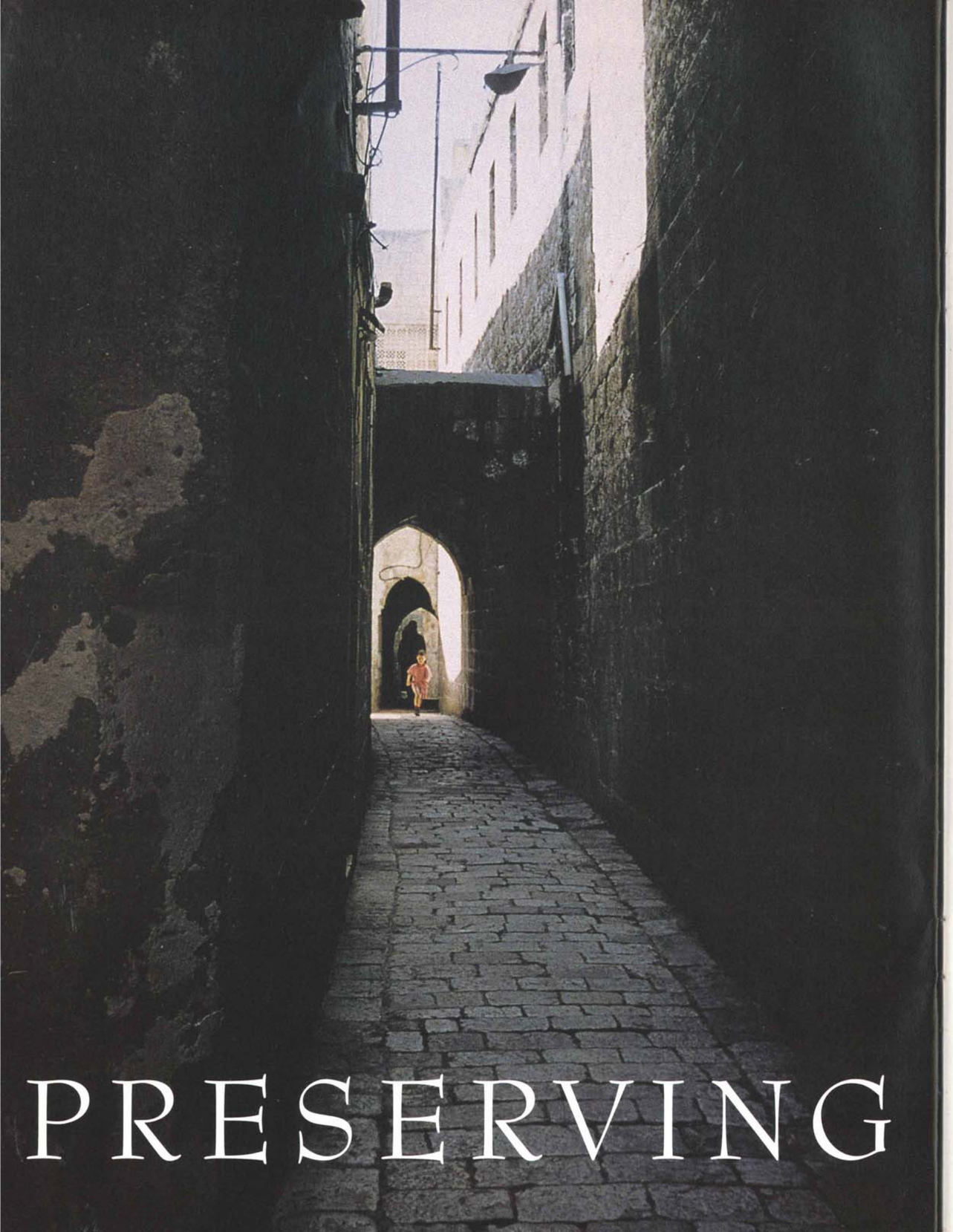
Now the increased presence of designs on paper led some artisans to work in different ways: Potters learned their designs from pattern books and weavers learned to follow the encoded instructions in large cartoons or smaller graphs. Not only did this development signal a split in the traditional unity of artist and artisan, but it also meant that old and new designs were free to be attached to whatever medium the artisan chose: Similar designs, for example, might now appear on textiles, ceramics, metalwork and in book illumination.

In both China and Europe, the start of paper manufacture was quickly followed by the development of printing, first with wooden blocks and then with moveable type. Block printing was also known in the Islamic lands, perhaps as early as 10th-century Egypt, where it was used for decorating textiles and producing inexpensive amulets ⑫, but it seems to have died out in the 14th century. Why was the idea of printing books or literary texts not seriously entertained in the Islamic lands until the 18th century? It was difficult to design a complete font of Arabic type, since some 600 sorts, or separate pieces of type, might be needed, as compared to 275 for a European language, including italics, points and figures. Furthermore, typeset Arabic would inevitably compare unfavorably with the fluid handwork of a calligrapher—indeed, it is still considered inferior today. Finally, traditional Islamic society accorded great respect to calligraphers and their work.

Thus printing came late to the Islamic lands. The first book printed in Arabic script was printed in Europe, and is believed to be the edition of the Qur'an that Paganino de' Paganini printed in Venice in 1538, of which a single copy was discovered in 1987. (See *Aramco World*, March/April 1992.) Only in the 18th century were the first presses established, with European help, at Aleppo and Istanbul. Knowledge had thus come full circle: Having given paper to Europe, the Islamic lands learned printing from Europeans.

Art historian Jonathan M. Bloom is author or co-author of several books on Islamic art and architecture. He has been researching the role of paper in Islamic art for several years, and his book Paper Before Print *will be published next year by Yale University Press.*

METROPOLITAN MUSEUM OF ART; OPPOSITE: SACKLER GALLERY OF ART/SMITHSONIAN INSTITUTION



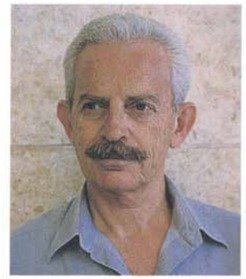
PRESERVING OLD ALEPPO

WRITTEN BY WILLIAM GRAVES · PHOTOGRAPHED BY JAMIL ZARNAJI / Courtesy of the Rolex Awards for Enterprise

For millennia—at least since the 20th century BC—Aleppo has stood at a crossroads of trade and empires, astride both the Silk Roads linking Europe with Asia and the caravan route through the Levant to Africa. Even when the Portuguese opening of sea routes into the Indian Ocean eclipsed much of this trade in the 16th century, Aleppo still prospered, and today it is Syria's second-largest city after Damascus, the capital.

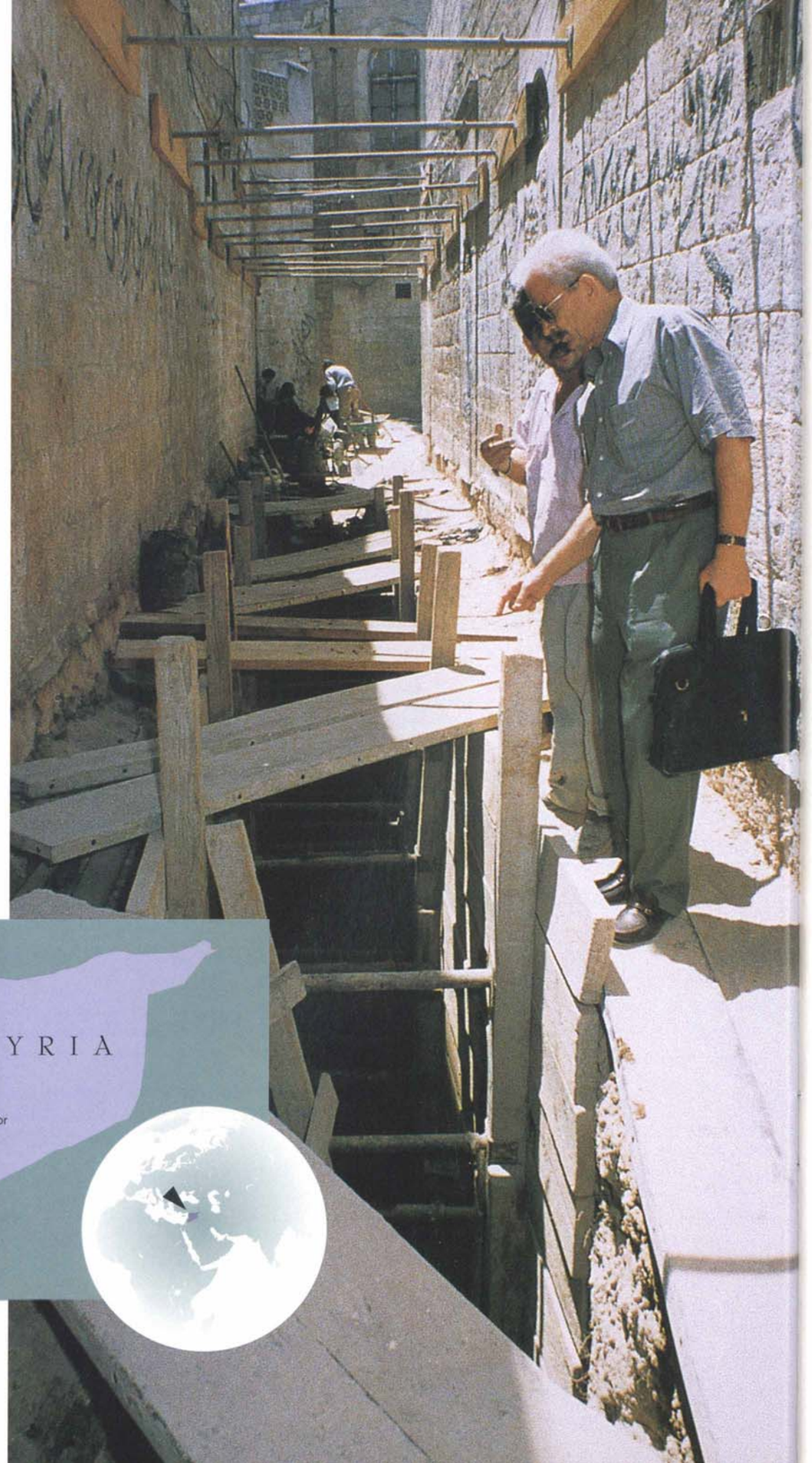
Only in our century did the automobile make it attractive for wealthy Aleppines to move to more spacious areas outside the Old City, upsetting its centuries-old economic balance. The city's 1952 master plan accelerated this exodus of wealth, and as municipal officials concentrated their early preservation efforts on the mosques and markets so popular with visitors, neighborhoods built of graceful courtyard homes, linked by capillary streets, were largely neglected. As the Old City's economy gradually declined, fewer and fewer of its inhabitants could afford upkeep.

By 1978, 20 percent of the historic city had been lost outright to the broad avenues and high-rise offices and residences mandated by the master plan. By the 1980's, though the population of Aleppo as a whole had topped 1.5 million, the population of the Old City had dropped from roughly 170,000 in the 1940's to fewer than 130,000. As an architect born in the Old City, Adli Qudsi decided that was already more than enough, and with a small group of fellow Aleppine architects, Qudsi successfully lobbied Syria's Ministry of Culture to declare ancient Aleppo a national historic monument. That brought the master plan, as Qudsi puts it, "to a screeching halt." The government appointed a conservation committee, which included Qudsi, to develop alternative guidelines for future planning in the historic district.



Restoration architect Adli Qudsi grew up among old Aleppo's 10th-century courtyard homes and 300 kilometers (186 mi) of capillary streets ***(opposite).*** *In the early 1980's he helped convince the Syrian government to declare the Old City a historical monument.*

"Cities like Aleppo were masterpieces. Their residential areas—clusters of dwellings with narrow, often dead-end alleyways—drew neighbors together in a feeling of human closeness and safety that reduced the pressures of daily life. And the houses themselves were works of art."



At first the committee's alternatives—most of which tightened building codes to preserve the quarter's character—were not unanimously popular with Old City residents. "The residents were a key factor," says Qudsi. "We not only had to preserve and repair the original architecture, we had to do it in cooperation with the people who lived there, many of whom had small incomes. The solution was obvious: Upgrade the public facilities around them and provide interest-free loans to help them rebuild their own houses according to the approved guidelines."

Qudsi was well-suited to direct this grassroots plan. He was born in a courtyard house in the heart of the Old City, and lived there into his teens. There he developed his devotion both to the Old City and to architecture generally. After attending university in the United States in the early 1960's, he practiced architecture in Seattle until 1975, then returned to Aleppo. Since then he has served as architectural consultant, urban planner, environmental architect and expert advisor to the United Nations Educational, Scientific and Cultural Organization (UNESCO).

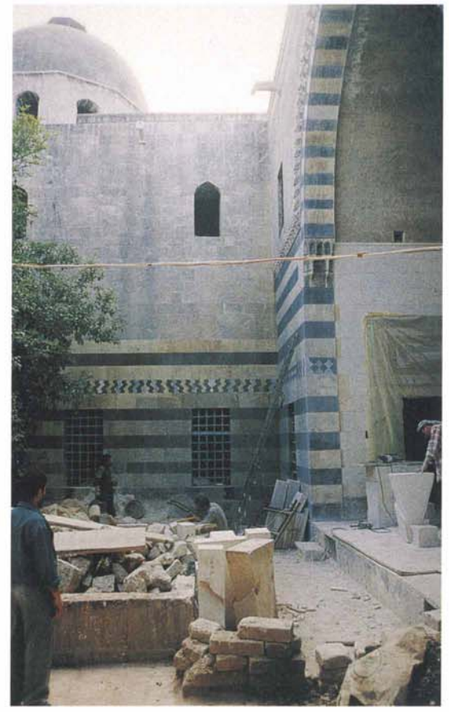
"Cities like Aleppo were masterpieces," he says. "Their residential areas—clusters of dwellings with narrow, often dead-end alleyways—drew neighbors together in a feeling of human closeness and safety that reduced the pressures of daily life. And the houses themselves were works of art." Centered around a courtyard that served as garden, playground and inter-generational gathering point, the houses were often designed with matching sets of rooms so the family could use them according to the season: Rooms facing north avoided the summer sun, and those facing south and west absorbed winter warmth.

"Despite their antiquity, these houses are well suited to modern living," Qudsi asserts. "They're roomy and comfortable, and it's a simple matter to add modern conveniences such as private baths, new kitchens, central heating and the like.

"But the Old City's infrastructure is different," he says, citing its 300 kilometers (186 mi) of stone-paved streets, under which run outdated water, sewer, telephone and electrical services. Until these are updated, Qudsi says, "no house or structure within the Old City can be secure."

The cost of such extensive renovations may run as high as $50 million, and the search for financial backing has been a long one. In 1984 Qudsi headed a successful effort to persuade UNESCO to add Aleppo to its World Cultural Heritage list, a move that gave the project international exposure in the field of historical preservation. Utilities in two neighborhoods of the Old City are currently being refurbished with funding from the City of Aleppo and Germany's government-owned Technical Cooperation Corporation (GTZ), which provided some $2.4 million in 1997 and has pledged long-term support.

But it is at the local level that Qudsi's work has proven most innovative. In 1993, with backing from the City of Aleppo and the national government, Qudsi chose a neighborhood of 150 houses and 1500 residents to take part in the pilot project. The next year, the city government adopted Qudsi's rehabilitation plan, based in part on interest-free loans to residents for restoration of their homes. Both the Kuwait-based Arab Fund for Economic and Social Development and GTZ contributed to the loan fund.



In addition to hundreds of houses now under restoration by their residents, Syria's second-largest city is also home to one of the best-preserved old markets of the Middle East and scores of baths, fortifications, schools and mosques such as this one. ***Opposite:*** *"No house or structure within the Old City can be secure," says Qudsi, until water, sewer, telephone and electrical lines are updated—a process that may cost as much as $50 million.*

Now, with more than 250 loans outstanding and rehabilitation under way, Qudsi and project director Tawfik Kelzieh are finding that many residents have become "much more attached to their homes," and that "ideas of selling and moving out have diminished." Planning of a second rehabilitation area is almost complete.

Last year, Qudsi's dedication and success brought him to the attention of the Rolex Awards for Enterprise, a biennial program recognizing "outstanding contributions to human endeavor," which named him one of 10 "associate laureates." But Qudsi is quick to point out that now, it is the residents who "are really running the show. This just shows what Aleppines can do together," he says.

William Graves served on the editorial staff of National Geographic *for 40 years, first as a writer, then as expeditions editor, and finally as the editor from 1991 until his retirement in 1995.*

For more information about the Rolex Awards for Enterprise, visit www.rolexawards.com.

Bangladesh Calling

Written by Louis Werner
Photographed by Kevin Bubriski

The neat red-brick path to Tingaon leads over an earthen berm, skirting fish ponds and rice paddies. It passes under mango trees and close by well-worn backyards that children share with chickens, ducks and water buffalo. Straw lies scattered across the way, left to dry where it can drain if an afternoon rain should fall.

Despite its timeless appearance, Tingaon is different from nearly all of Bangladesh's 85,000 rural settlements. It is not the power cable, loosely hung from tree to tree, that makes Tingaon different: In this relatively prosperous Narayanganj district, not far from the capital, Dhaka, the number of villages that have electricity is above the 20-percent national average. Nor is the fact that many of Tingaon's native sons are working overseas much of a distinction: So do some two million other Bangladeshis.

The difference becomes audible when an electronic jingle penetrates the afternoon air, sounding quite out of place among the natural sounds of the village. Fifty-five-year-old Hajera Begum answers her cellular phone like a seasoned long-distance operator. "Hello. Hello. Yes, Paribanu is at home. I saw her there not long ago. Call again in 10 minutes after I go to her." What sets Tingaon apart is the availability of telecommunications, complete with clear connections, modest prices for local and international calls, and even door-to-door service.

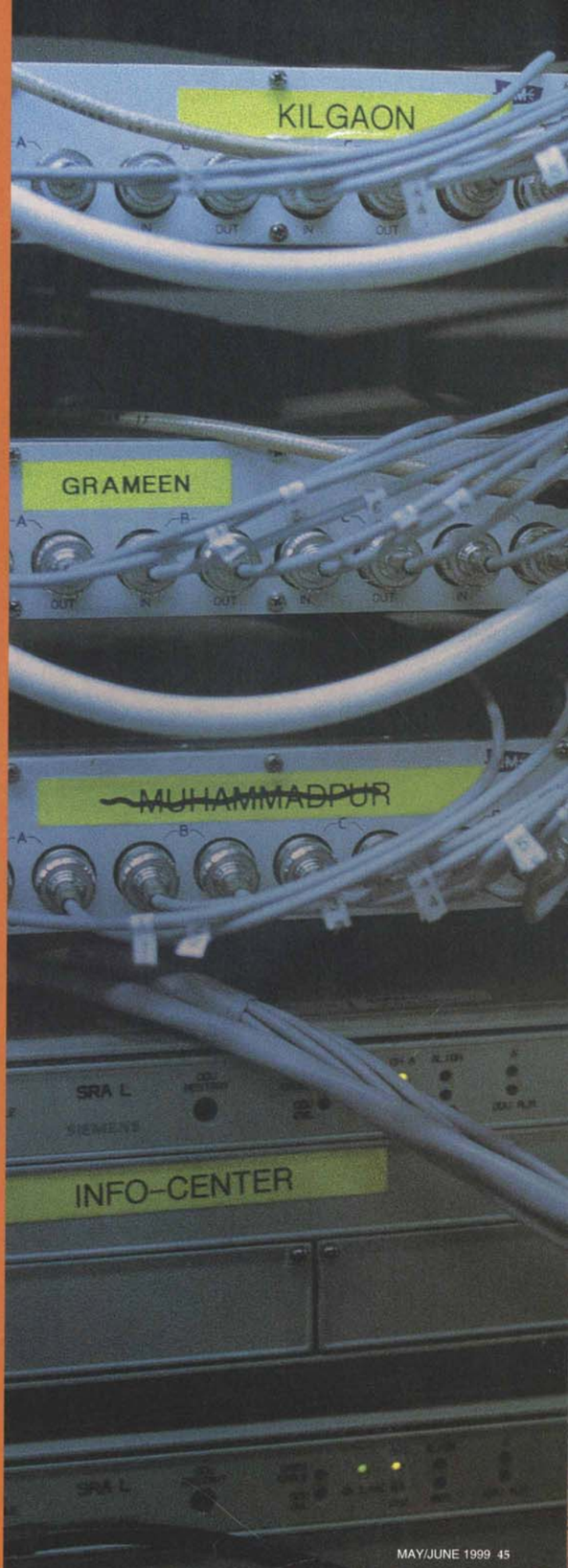
Hajera Begum is a "phone lady" in an innovative program established by Grameen Bank, the 23-year-old Dhaka institution whose pioneer work in "micro-enterprise" among the poor has revolutionized development financing and development philosophy around the world. Now well into a pilot program, over the next few years Grameen hopes to make cellular phones, fax lines, e-mail and Internet services available throughout Bangladesh's countryside, and in so doing utterly revolutionize the way rural Bangladesh communicates with the rest of the world.

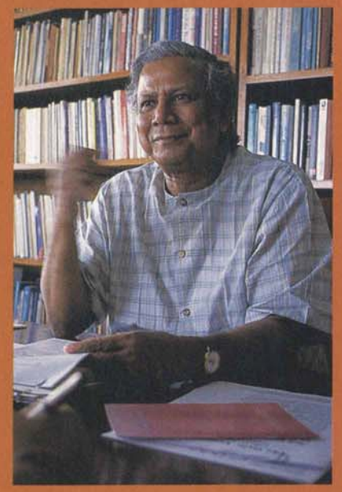
The bank is boldly trying to vault a nation of villages over the copper-wire stage of communications, bringing satellite technology to residents who never had conventional telephone service because of the prohibitive cost of installing the necessary infrastructure.

Given its history, this is a natural move for Grameen Bank, which over the past two decades has extended some $2.4 billion in loans, whose principal amount averaged a minuscule $100 each, to more than 2.3 million rural Bangladeshis. More than 90 percent of Grameen's borrowers are women, and the loans enable them to buy productive assets: milk cows, sewing machines, fishing nets and, lately, cellular telephones, which they operate like public phone booths for their neighbors.

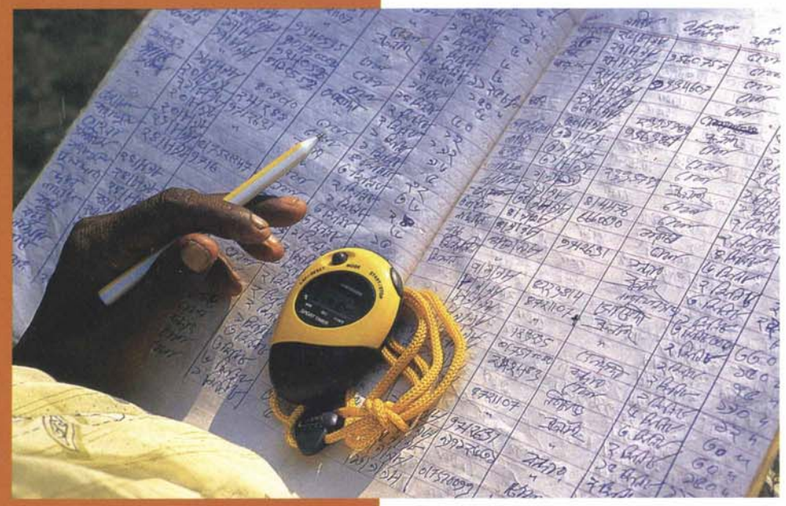
Grameen was founded in 1976 by Muhammad Yunus, then a Chittagong University economics professor who one day happened to meet a market vendor unable to buy 25 cents worth of cane that she needed to make a product she could sell. When he asked why she didn't apply for a bank loan, she laughed, and Yunus quickly saw her point. In the view of commercial bankers, bigger loans are better loans. Small loans cannot turn a profit, according to the conventional wisdom, and very small loans are not even worth considering.

Yunus lent the woman 25 cents out of his own pocket. Then he did an informal survey in her village. To his surprise, he found more than 40 small-business people—vendors, farmers, artisans—who said they could benefit from a loan, and the average amount





Grameen Bank's founder is former economics professor Muhammad Yunus, whose initiatives have made microcredit a revolutionary model concept among development agencies worldwide. **Below:** In Bibijura village, Ana Bibi's timesheets account for calls from her phone. **Opposite:** Grameen Phone advertises in downtown Dhaka, capital of Bangladesh. Grameen maintains its own phone repair center **(right)**. **Previous spread, left:** In addition to serving Rajabhari village, Jasmeen Begum uses her phone to keep in touch with her husband, who works abroad like two million of his countrymen. **Previous spread, right:** All Grameen calls pass through the switching station in Dhaka.



they said would be useful was less than a dollar. From this experience was born the idea of microcredit—and the notion that access to credit should be recognized as basic human right.

Since then, Grameen has been the guiding light of the microcredit movement, and its poverty-fighting successes have won over governments in both industrialized and developing countries, nonprofit institutions across the globe, and international organizations such as the World Bank, the United Nations Development Program and the International Fund for Agricultural Development. Yunus has been awarded the World Food Prize for Grameen's agricultural loans and the Aga Khan Prize for its low-cost housing loans. In the 1980's, Bill Clinton, then governor of Arkansas, asked Yunus to help him start a Grameen-style fund in his state, and in 1996, Hillary Clinton met with Grameen borrowers when she visited Bangladesh.

At the second international MicroCredit Summit conference in New York last June, chaired by Peruvian president Alberto Fujimori and World Bank president James Wolfensohn, delegates from 100 countries adopted the goal of extending microloans to 100 million poor people worldwide by 2005. For its part, Grameen signed up to reach 10 million of them by replicating its Bangladesh programs in other Asian countries.

While experts agree that the dynamism of entrepreneurship and self-employment is most easily tapped in traditional rural enterprises such as crafts and agriculture, Yunus does not want that to limit people's imaginations. "Why not go high-tech in the villages?" he asks. "Telecom, the Internet, data processing—we're ready for it all.

"Technology today is different from what it was yesterday," he continues. "It's no longer the same inert hardware it was for first-generation users. Now it's more like malleable clay, ready to be shaped at will. PC's have been trickling into South Asia for a decade, and many people still see them as toys. But cell-phones have been put to serious use overnight. And that technology is just the tip of the digital iceberg."

Yunus believes strongly enough in rural high-tech to have founded Grameen Telecom, Grameen Communications and Grameen Shakti, which will introduce cellular phones, the Internet and renewable energy services respectively. (*Grameen* means "village"; *shakti* means "power.") Like Grameen's other specialty lines of business, which include fish farming and hand-loomed textiles, these three start-ups rely on private-sector banking principles: making loans at market rates of interest, insisting on full repayment, and maintaining professional standards in all respects.

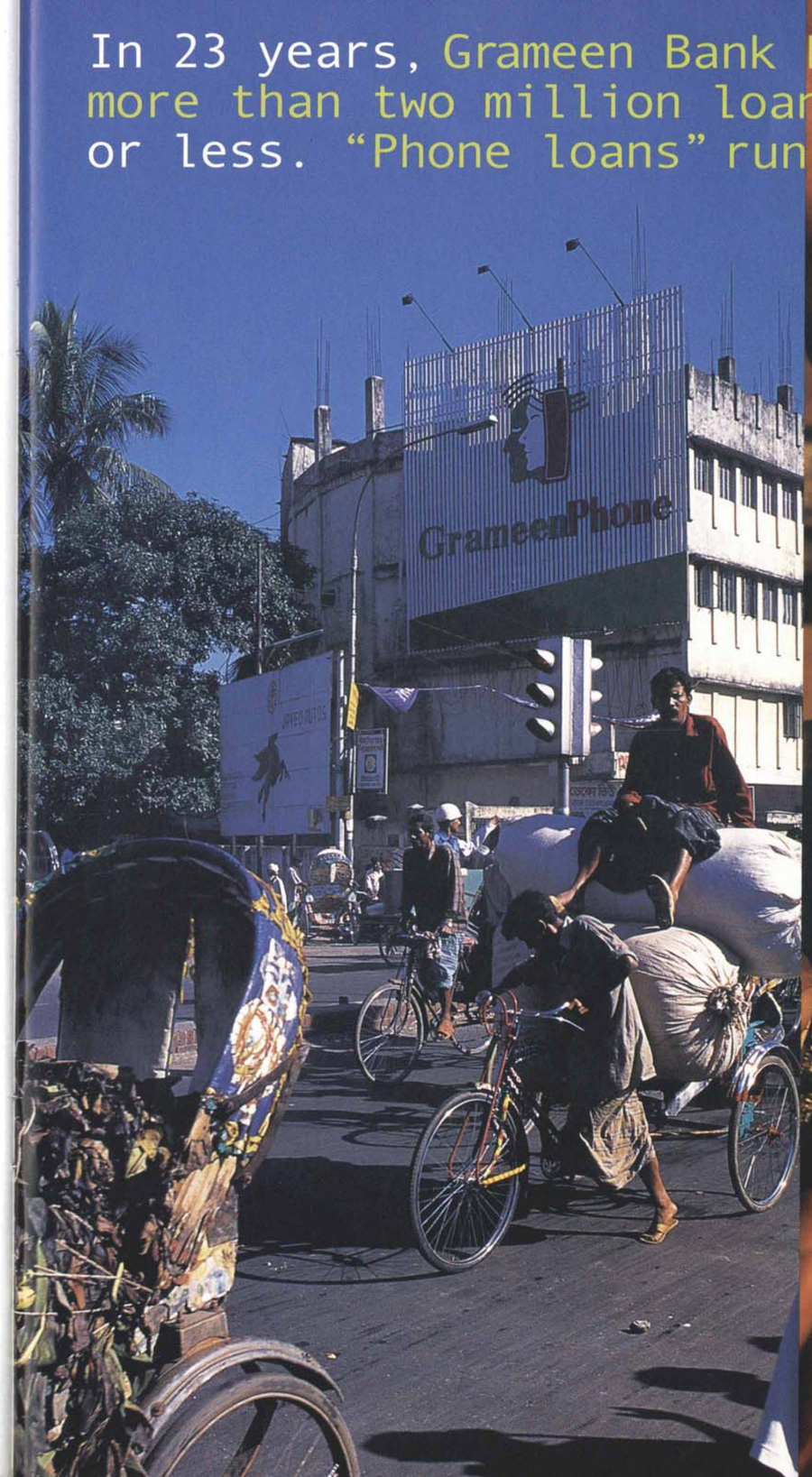
Grameen has found that the borrowers gain self-confidence and a broader world view, Yunus says. Being a full, paying customer gives one the right to receive good service and good value, and that certainty of entitlement displaces the supplicant, even cringing, hope of good treatment that is common among the very poor.

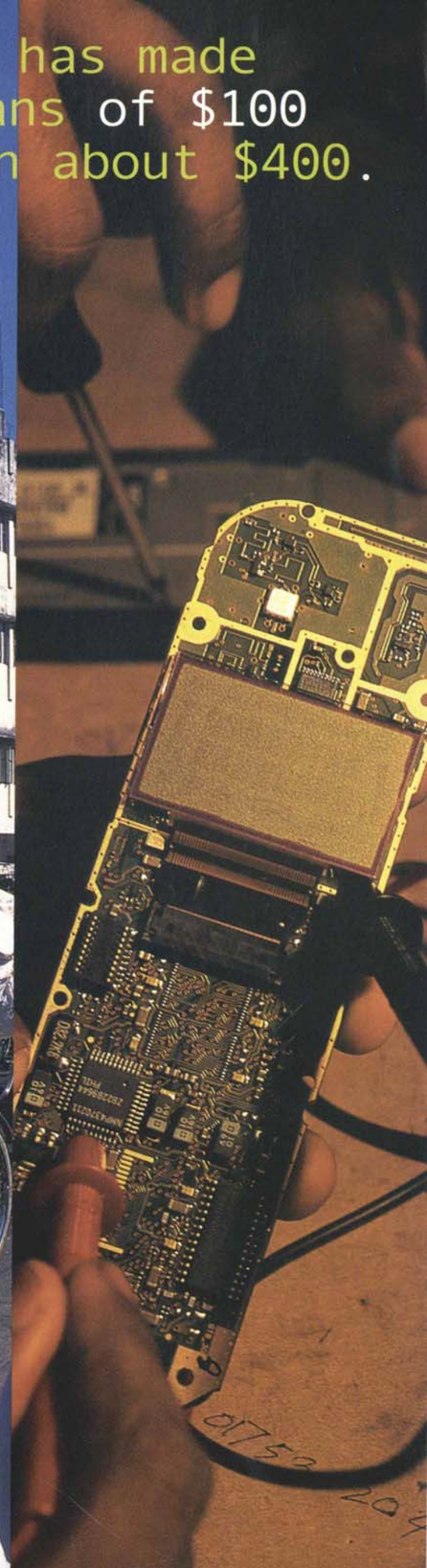
"We are a bank," insists Yunus, "not a development project. We give loans, not charity." Grameen's close tracking of every loan, its insistence that every borrower should be part of a local group of borrowers, and its astonishing 98-percent repayment rate testify to that.

Hajera Begum knows all about Grameen's strict accounting and her responsibility to the bank. Her phone loan, which bought a Finnish-made handset and battery charger, a stop watch, a calculator and an advertising signboard, came to more than $400, which she will repay over three years in weekly installments of five dollars each. The principal amount of this loan amounted to about four times that of a milk-cow loan, which is the most frequent purpose of Grameen loans. Eligibility for a phone loan thus requires a credit history: The borrower must have received and paid off at least three previous loans.

A joint venture between Grameen and international partners owns and operates the phone system itself. Phone owners such as Hajera are billed four cents a minute for outgoing local calls and about one dollar a minute for international calls. Incoming calls, whether international or domestic, are not billed.

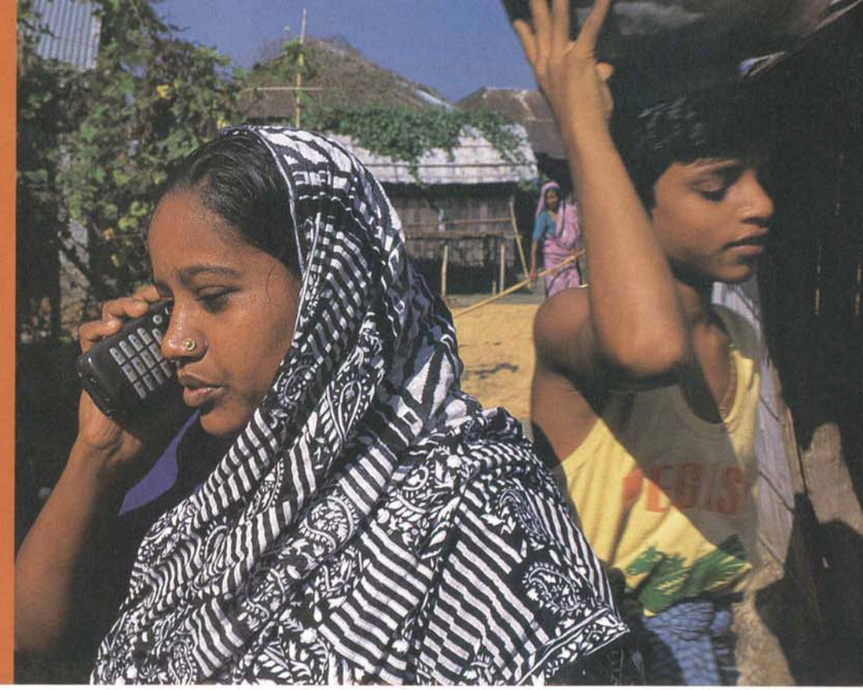
To turn a profit, Hajera doubles the outgoing charges to her customers, whose calls





Job creation, facilitated not only by cellular phones, but also by solar electrical generators and eventually the Internet, **is the goal of Grameen's rural high-tech push.**

To qualify to become a village "phone lady," Nilufa Begum, of Durigaon village, had to have repaid at least three previous Grameen-sponsored loans. **Opposite:** Tingaon village was one of the first served within Grameen's 250-phone pilot project. By 2004, Grameen plans to have distributed 50,000 phones nationwide.



she times with the stopwatch and writes into a logbook. Incoming calls she handles as she did the call to her neighbor Paribanu, either taking the phone to the person's home or sending a child to fetch them, then waiting for the callback. For this service she might charge a flat rate of 10 or 20 cents, depending upon how far she or the messenger had to walk to find the person called.

Hajera Begum's head for numbers does not stop at call rates. She is slowly filling her personal telephone directory with important phone numbers, including the office of her administrative subdistrict, or *thana*, the police station, the infirmary, and even the citizens' inquiry line of Prime Minister Shaykhah Hasina.

"Yes, the prime minister herself," she insists with a shy smile. "My son thought her number would be good to have, so he asked for it at a political rally. The party official in charge must have thought it was a joke to give an eighth-grader his prime minister's telephone number. And no, I have not tried to call. I have had no reason to, yet."

In nearby Bibijura, "phone lady" Ana Bibi's teenage son Salim has been a bit more bold. "I often call our member of parliament. He is a friend of mine," he says. "I know his number by heart." Ana's personal directory includes the numbers of other phone ladies in Narayanganj district. If she has a question about her monthly loan statement or simply wants to chat, she just calls, as naturally as she might before have walked over to a neighbor's house.

Because phone borrowers have already proved themselves to be successful business people, it is not surprising that Ana Bibi once hired a bicycle rickshaw with a loudspeaker to announce her phone service in nearby villages. With only one or two public booths in each thana of roughly 150,000 people, there are plenty of potential customers, and letting them know about her service makes sense.

Bibi also advertises in the local magazine *Gemstone*. "The world is getting smaller by the day," her copy reads, "ever nearing your grasp. So save time and money with a new village phone. Let us all move forward together." Like many Bengali-language publications, this one shows a high regard for a literary turn of phrase.

That using a Grameen phone saves money is not lost on cotton seller Munir Hussein of Ispalani village in Bundur thana. "I sell scraps from Dhaka's mills to buyers in Rajshahi division," he says, speaking of Bangladesh's northernmost region. "To get there and back I used to travel four days and spend $25 in train fare. But now I can make and get calls from there, and save most of that money and all the time."

Hussein is seconded by furniture maker Ala Uddin, who previously had to travel four hours round-trip to Dhaka just to communicate a simple yes or no to a business proposal. Now Ala Uddin uses the Grameen village phone service to call his partner, who has bought himself a cellular phone through Grameen's higher-margin urban sales division.

But for most, the lack of phone service is still the frustrating norm. Zahira Begum of Polashur village, just across the Buriganga River from Dhaka and within sight of its high-rise buildings, exchanges audiocassette letters with her brother working in Kuwait. What irks her is not so much that she cannot call him, but that she cannot call Dhaka. "I wish I knew how much they were paying for rice in the market there," she says. "Here we sell to the middleman at whatever price he offers us."

While the rural service is just now getting underway with 250 phones, Yunus expects that five years from now there will be some 50,000 "phone ladies" in a nationwide network. In a country of 120 million people with only 400,000 existing telephone lines, most of which are in the cities, the impact of this change promises to be enormous.

Nazneen Sultana is the head of Grameen's software unit, and he believes villagers will soon be doing more than just working by phone. "Soon I expect to see them at keyboards, doing data processing for international credit-card companies.

Today Bangladesh has only one land-based phone line for every 300 people. The impact of cellular communications technology promises to be enormous.

Many villagers have good English and math skills, so once we get fast Internet connections, we'll be able to underbid other countries currently doing that work offshore. It will definitely be a growth industry for us."

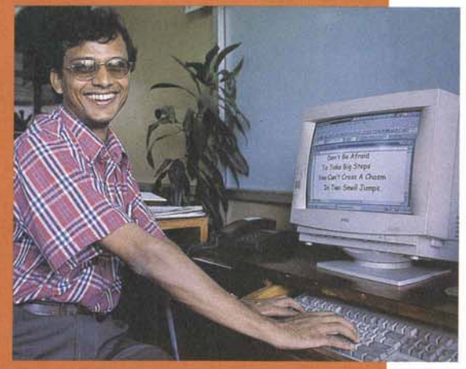
Job creation is at the center of Grameen's push to take high-tech to the countryside. A glance through any one of the phone ladies' logbooks, listing incoming calls from London, New York, the Gulf countries and Japan, reveals one of the harsh consequences of rural unemployment. Throughout Bangladesh, men have left home to seek work in faraway places, struggling against the odds to keep their families intact by means of repatriated earnings and, when possible, phone calls.

More generally, the economic impact of Grameen's rural high-tech policy is evident in its loan program for renewable energy generators. With more than four out of five Bangladeshis living without electricity, and some 60 percent of the country's total energy needs being met by burning cow dung, sales of small solar-power systems are increasingly strong, and biogas plants and wind turbines are being tested.

Dipal Barua, head of the energy unit at Grameen Shakti, sees magic in a light bulb. "People can do with electricity things they could never do with candle wax or kerosene," says Barua: "Study, work, make market sales—all things that, sooner or later, will bring them out of poverty."

In Dhalapara village, half a day's drive north of Dhaka, Grameen branch manager Abdu Salam Khan sold 30 solar energy systems in just four months, and he says that as neighbors see these at work, he is receiving more queries daily. "To light a kerosene lamp for just a few hours costs 25 cents for fuel," he says. "Why not pay half that for electric light all night long?"

Grameen-designed solar systems are very modestly sized, in keeping with their users' needs and wallets. The systems employ imported solar cells, but the charge controllers, fluorescent lamps and eight-watt tubes are all manufactured in Bangladesh. A 17-watt panel costs about $290; the 75-watt array runs $750. On the drawing board is a smaller, one-lamp system that will cost less than $150.



Reflecting the organization's optimistic spirit, Grameen Telecom's manager for research and development, Muhammad Nazmul, shows off one of his favorite aphorisms. **Opposite:** In addition to loans, Grameen also offers phones for direct purchase from the sales office of GrameenPhone, which expects to draw nearly half a million new, urban subscribers by 2006.

Inside back cover: Jasmeen Begum poses with her children in Rajabhari village.

Even with Grameen Bank financing, such prices are still well beyond the reach of many. Even so, there are trickle-down effects: One resident of Dhalapara, Dibon Krishna Shahah, rents power for three bulbs from a neighbor's 75-watt system. "My wife keeps up her tailoring business and my son stays at his school books a few extra hours each night," he says. Sawmill operator Muhammad Abu Hanif installed a 17-watt lighting system, which nets each of his four employees an additional $2.50 a day by extending their working hours.

While Grameen and other micro-credit banks in Asia and Latin America can build on two decades of experience, similar institutions in the Middle East and North Africa are relatively new. According to the World Bank, among the approximately 60 microcredit lenders in the region, as yet only two—both in Egypt—have achieved financial sustainability and broad outreach.

Ten Arab countries were represented at the New York MicroCredit summit. Among their delegates was Mostafa Yassin, executive director of microenterprise development at the Credit Guarantee Company, a consortium of five Egyptian banks that lends in the $100-$300 range through local non-governmental agencies. Yassin came out of retirement after a career at the Arab African Bank to take on the familiar task of administering small amounts.

"In many ways it's like going back to my childhood," he says. "I remember as a boy, putting a few piasters into a savings account at the neighborhood postal bank. It was quite a modest amount and it grew very slowly, but nonetheless I learned how a bank helps a community. That is what I want to teach our clients—that borrowing, investing, and saving is a natural thing to do."

One of Yassin's colleagues in Egyptian microfinance is Mohsen Youssef, director of the Ibn Khaldun People's Monetary Fund. Youssef believes that sound, poverty-breaking business practices are not always easy to cultivate among the poor, even though they are highly motivated.

"Training, training, training—that is the key," says this former manpower-planning specialist. "It's easy to give money away but hard to get it back. First-time borrowers always need advice and oversight." Even so, Youssef concedes that the existence of cooperative savings groups in many Arab countries is making microcredit a increasingly familiar concept.

A handful of the Arab microcredit organizations operate under Islamic financial rules. According to Judith Brandsma of the World Bank, one of the most active is run by the Hodeidah Women's Union in Yemen. Structured as a *mudarabah*, or limited-partnership bank, it makes $100 loans to small-business borrowers, and in effect then becomes a shareholder in the business, entitled to a proportional share of profit or loss. Throughout the region, Brandsma says, the World Bank estimates that some 4.3 million people could benefit from small loans, but at present very few of them can be served through existing financial institutions.

However, Brandsma is among those in the field who think that microcredit, for all its benefits, has been oversold in recent years as a panacea for poverty and an engine for social development. Not everybody is suited to self-employment, she notes and, more to the point, some consequences of poverty—such as malnutrition, poor health and illiteracy—just have to be fought head-on rather than indirectly through job creation.

Yet the residents of Rajabari village in Bangladesh are not quibbling with what Grameen has made possible for them. When an electronic trumpet flourish announces another incoming call, phone lady Jasmeen Begum answers. "Please call back in 10 minutes," she says. "We must go to your wife." Her husband, Khurshad Alam, walks the phone down the dirt lane to the house of Pirooja Munir, whose spouse dutifully rings again from his worksite—in Bahrain.

Pirooja listens intently. A smile finally spreads across her face as she says goodbye. Her husband is coming home soon on leave, she reports. She has his arrival information and will meet him at the airport. But more important, she and her two children and her sister-in-law will be going back to Bahrain with him: The visas have been arranged. "No more worrying now," she says with a sigh of relief. "I'm glad he was able to get through."

Louis Werner is a writer and filmmaker living in New York, and a regular contributor to Aramco World.

Kevin Bubriski lived and worked in Asia for more than eight years, and his photographs have been widely exhibited and collected. He now lives in Vermont.

Events & Exhibitions

Ancestors: *Art and the Afterlife* explores varied relationships between art and concepts of afterlife. One of five sections is devoted to ancient Egypt and Sub-Saharan Africa. **Los Angeles** County Museum of Art, through June 14.

Teaching About the Arab World and Islam is the theme of teacher workshops co-sponsored by the Middle East Policy Council in Washington, D.C., and conducted by Arab World And Islamic Resources and School Services (AWAIR) of Berkeley, California. Sites and dates include: **Lakewood, Colorado**, June 18; **Richmond, Virginia**, June 22; **Abiquiu, New Mexico**, June 28. Phone 202-296-6767 or 510-704-0517 or write awair@igc.apc.org.

Jiddah Today shows black-and-white photographs by Princess Reem Mohammed Al-Faisal, together with **Photographs of Arabia, Hijaz 1907-1917**, which draws upon the archive of the French Biblical and Archeological School of Jerusalem. Institut du Monde Arabe, **Paris**, through June 20.

Ancient Gold: *The Wealth of the Thracians, Treasures from the Republic of Bulgaria.* Gold and silver vessels, ornaments, weapons and more demonstrate artistry among the tribes of Thrace, who dominated much of east-central Europe from the fifth millennium BC to around 400 of our era. **Detroit** Institute of Arts, June 27 through August 29.

Ancient Cyprus: *A Selection of Pottery and Sculpture* examines the influences that converged in Cyprus from the Bronze Age through to Roman and Byzantine times. Royal Ontario Museum, **Toronto**, from June 28.

Beyond the Image exhibits contemporary abstract paintings by Nawal Abdallah, Faisal Samra and Hussein Sherief. **Jordan** National Gallery of Fine Arts, **Amman**, through July 3.

The Sublime Arts of Ancient Egypt constructs an itinerary through 25 centuries of Egyptian art, using more than 60 masterpieces from the museums of Cairo and Luxor. Palazzo Strozzi, **Florence**, through July 4.

Indian Drawings of the Late 16th to Early 19th Century. This selection presents works from the Muslim Mughal and Deccani courts as well as from the courts of Rajasthan and the Punjab Hills. Metropolitan Museum of Art, **New York**, through July 5.

Navigate the Nile is a multimedia class for grades 4 and 5 that offers "exploration" of ancient Egypt, July 5–9, 10:00 a.m.–noon. **Mummy Mysteries** is a similar class for grades 2 and 3, July 12–16, 10:00–11:30 a.m. **Toledo [Ohio]** Museum of Art.

Egypt: Between the Sun and the Crescent Moon presents 78 textile pieces—most never before exhibited—whose threads tie us to pharaonic, Roman, Byzantine, Arab and Ottoman Egypt, worlds which have in many ways influenced how we live, what we believe and what we produce today. Centre de Documentació i Museu Téxtil, **Terrassa, Spain**, through July 11; Caixa d'Estalvis, **Manresa, Spain**, August through October.

Understanding the Islamic Paradigm: *A Summer Program* is sponsored by Arab World and Islamic Resources (AWAIR) of Berkeley, California. Art, poetry, chanting, lectures and dialogues will help non-Muslims understand the faith journeys and world views of Islam. **Ghost Ranch, New Mexico**, July 11 through 18. Phone 505-685-4333; or write awair@igc.apc.org.

Egyptian Art in the Age of the Pyramids. This major exhibition, spanning from the third through the sixth dynasty, covers the first truly great era of Egyptian art. Some 200 works have been assembled from museums based in the US and six European countries. Grand Palais, **Paris**, through July 12.

Nainsukh: *Painter from the Punjab Hills* features 30 works by the mid-18th-century master from Jasrota. Sackler Gallery, **Washington, D.C.**, through July 18.

The Nature of Islamic Ornament, Part III: *Geometric Patterns* explores the history of complex patterns derived from simple figures (circles, triangles, polygons) by combination, reflection, rotation and interlacing. Metropolitan Museum of Art, **New York**, through July 18.

Jewels is a performance of contemporary Arab music and dance choreographed by Cassandra Shore in honor of the 10th anniversary of her founding of the Jawaahir (*"Jewels"*) Dance Company. Southern Theater, **Minneapolis**, July 22–25 and July 29–August 1. Phone 612-872-6050.

Egypt, Gift of the Nile: *Ancient Egyptian Art and Architecture From the University of Pennsylvania Museum* highlights the University's century-old archeology program. Joslyn Art Museum, **Omaha, Nebraska**, through July 25.

Hidden Treasures From Cyprus: *Finds From Aphrodite's Shrines in Idalion* displays jewels and sacred objects that demonstrate the importance of Aphrodite's cult. Pergamonmuseum, **Berlin**, through July 31.

Indonesian Gold: *Treasures from the National Museum, Jakarta* brings 70 fine works spanning the seventh to the 20th centuries to the Art Gallery of New South Wales, **Sydney**, **Australia**, through August 1.

Adobe and the Architecture of Hassan Fathy displays photographs and video of vaulted mud-brick houses in Texas built by Simone Swan, student of the late Egyptian architect. Camera Oscura, **San Casciano dei Bagni, Siena, Italy**, through August 3.

Treasures of the Sultans: *Topkapı at Versailles.* **Versailles [France]** Palace Museum, through August 15.

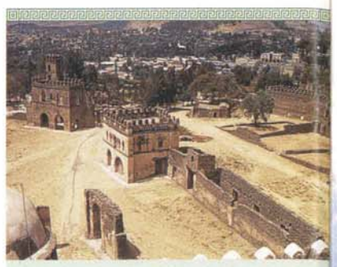
Third Annual Arabic Music Retreat offers study, performance, theory and history. Faculty include Simon Shaheen, Marcel Khalife and others. Mount Holyoke College, **South Hadley, Massachusetts**, August 15–22. Phone 781-740-0788 or visit http://www.simon-shaheen.com.

Images from a Changing World: *Kalighat Paintings of Calcutta* captures the vibrant, late-19th-century school. **Los Angeles** County Museum of Art, through August 30.

Royal Persian Paintings: *The Qajar Epoch, 1785–1925* shows more than 100 works. Catalogue. Brunei Gallery, SOAS, University of **London**, through September 30.

Jerusalem displays artifacts and lithographs by David Roberts, British painter of the Middle East. Catalogue; sixth-grade lessons regarding Saudi Arabia are also available. The Nance Museum, **Lone Jack, Missouri**, through October. Phone 816-697-2526 or 817-346-1535.

The Saudi Aramco Exhibit, which relates the heritage of Arab-Islamic scientists and scholars of the past to today's petroleum exploration, production and transportation technology, is being extensively renovated and updated. **Dhahran, Saudi Arabia.**



Ethiopia is among the world's most culturally variegated nations. Though it is little larger than France, Spain and Austria (or Texas and California) combined, its people speak more than 80 languages. Almost half its 58 million people are Muslims, and 17th-century architecture in Gondar, a former capital of the Ethiopian empire **(above)**, shows Islamic influences. **Ethiopia:** *Heritage of an Empire* introduces visitors to Africa's third most populous nation in imaginative and extensive displays combining painting, film and video with hundreds of objects—from goldsmiths' work to household goods—as well as walk-through replicas of a market, a Muslim house, a church, a modern Addis Ababa café and the national museum. The exhibit strives for balance between the empires of the past—which date back to Menelik, believed to have been the child of King Solomon and the Queen of Sheba—and the struggles of the present. Catalogue (in Dutch) *f*25. Tropenmuseum, **Amsterdam**, through August 15.

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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