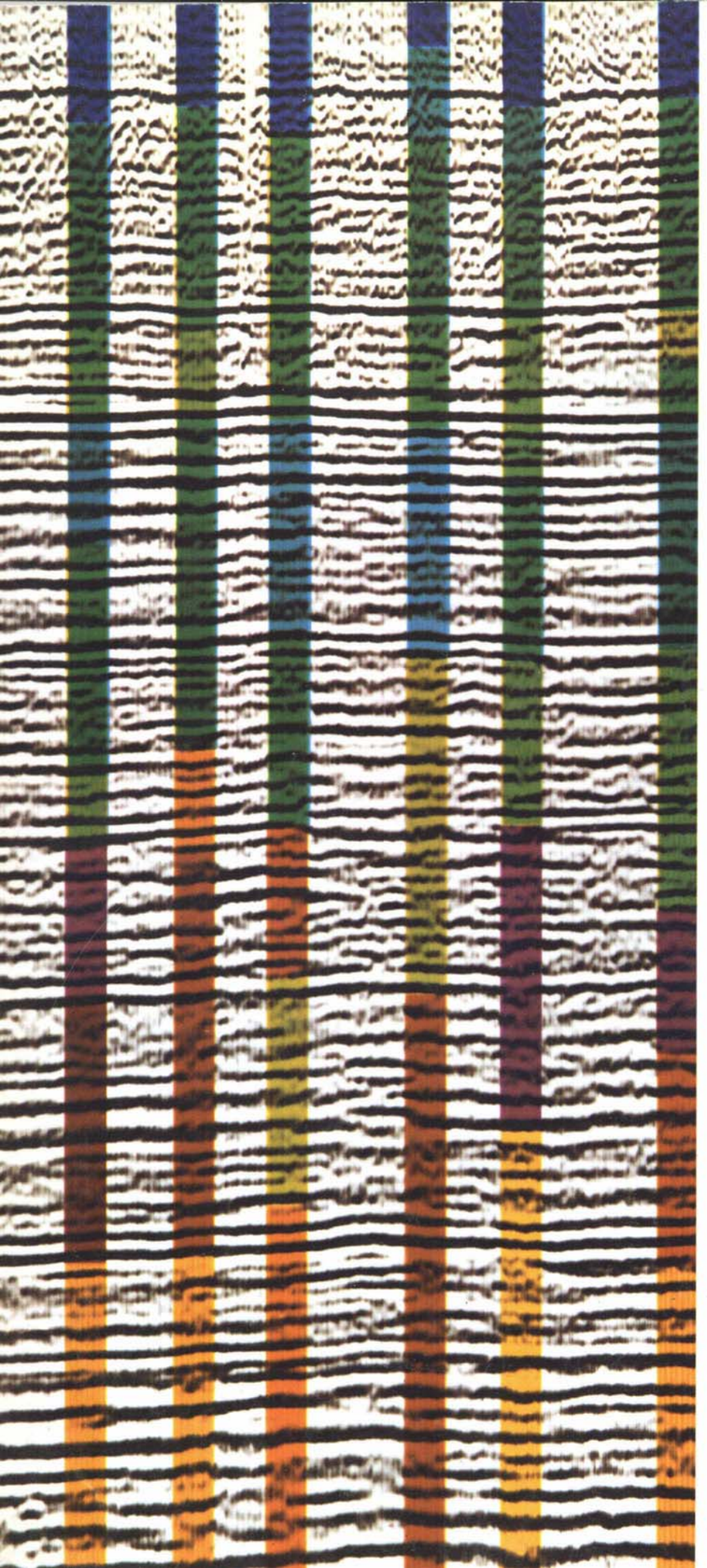

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A GREENING IN THE ARAB EAST

ARAMCO WORLD magazine

VOL. 23 NO. 6 PUBLISHED BIMONTHLY NOVEMBER-DECEMBER 1972

MANUSCRIPTS OF MUSLIM SPAIN 2

BY DAVID JAMES

James

The craftsmen of Islamic Spain and North Africa didn't just work on their celebrated architecture; they also created lovely, but little-known, illuminated manuscripts.

PDSA 4

BY HELEN GIBSON

Gibson

In a hospital with a difference, Egyptian veterinarians care for both Cairo's pampered pets and the hard-working draft animals of the city's numerous cart owners.

POSITIVELY EARTHSHAKING 8

BY BRAINERD S. BATES

Bates

In Saudi Arabia outlandish new vehicles shake things up to help decipher the geologic mysteries which lie below the surface of the desert.

A TALK WITH VIOLET DICKSON 13

BY WILLIAM TRACY

Tracy

A vibrant British woman who has lived over 40 years in Kuwait tells of the changes which have come to its people since she went there with her husband in 1929.

A WEDDING IN TYRE 20

BY DIANE WILLMAN

Willman

The two young archaeologists restored the 18th-century church, found two older churches beneath it, then decided it would be a good place for a wedding.

A GREENING IN THE ARAB EAST 24

BY JOSEPH FITCHETT

Fitchett

"It's a buffalo gourd," the farmer-researcher said. "Rich in protein. And if it yields like this in the desert it could be part of the answer."

Attractive blue binders designed to hold 12 issues of Aramco World Magazine are available from Easibind Ltd., 4 Uxbridge Street, London, W8 7SZ, England at the price of $2.25. Make checks payable to Easibind Ltd.

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Cover: In Saudi Arabia, and throughout the Arab world, governments and foundations are engaged in extensive arid land crop research. Photographer Nik Wheeler's broad checkerboard of ripening grain in Lebanon's high Bekaa Valley symbolizes the future impact of modern agricultural techniques on the entire area. Story on page 24.

←Violet Dickson, who has lived in Kuwait since 1929, certainly knows the life and ways of the Bedouins better than any foreign woman—and most men. Story on page 13.

The illuminated legacy of Andalusia's craftsmen...

Clockwise from top left: final pages of a Koran, 16th century, Morocco; a book of prayers by the Mauritanian Ma' al-'Anayn al-Shingiti, circa 1910, Morocco or Rio de Oro; Koran, 13th century, probably Islamic Spain; the prayerbook **Dala'il al-Khayrat,** 1639, Morocco.

MANUSCRIPTS OF MUSLIM SPAIN

BY DAVID JAMES / PHOTOGRAPHED BY PETER KEEN

Illuminated manuscripts from the Chester Beatty Library, Dublin, Ireland.

Whenever anyone thinks of the art of Islamic Spain it is usually the great architectural monuments which come to mind; the Alhambra must be as familiar to most Europeans as the Parthenon. Yet the Muslim craftsmen of Islamic Spain — Al-Andalus — were equally skilled in the arts of metalwork, pottery, woodcarving, tilework and—as the museums of Spain and Europe testify —the art of manuscript illumination.

The production of manuscripts was always a thriving concern in Islamic Spain, but never more so than during the 10th and 11th centuries, when Al-Andalus probably boasted the highest literacy rate in Europe. The great Dutch historian of Muslim Spain, Reinhart Dozy, declared that during the days of the Andalusian caliph 'Abdul-Rahman III (912-961), nearly everyone could read, and although doubtless this was an exaggeration, it is fair to assume that the country contained an unusually large percentage of literate people. Certainly book-collecting was one of the passions of the times. Both 'Abdul-Rahman and his son Al-Hakam II (961-976), amassed huge libraries. The son's library is said to have numbered 400,000 works, with the catalogue alone filling 44 volumes and many of the works lavishly decorated by the scribes, gilders, printers and binders.

The Koran, of course, as the Holy Book of Islam, was richly embellished. By the 11th century most Korans began and ended with double pages of decoration and contained elaborate surah–chapter–headings and marginal embellishments. The opening and terminal pages were geometrical in character, usually based upon a circle within a square. They frequently included floral and vegetable motifs and the total design was enclosed within a knotted or interlaced border.

Unfortunately, knowledge of Andalusian manuscript illumination is limited; for large quantities of books suffered wholesale destruction in Spain on numerous occasions. One such time, according to the 19th-century Spanish historian Don Pascual de Gayangos, was in 1499, when Cardinal Ximénez de Cisneros burned a veritable mountain of Arabic manuscripts in Granada (on the assumption that anything written in Arabic had to be a Koran and therefore a danger to "the faith.")

Perhaps this wide destruction accounts for the strange absence today of western Arab-world manuscripts containing miniatures such as those commonly seen in Turkey, Persia and India. In fact, only three are known to have survived. One is a copy of the treatise on astronomy by Al-Sufi (died 986); the second is a 13th-century love story titled after its hero and heroine "Bayad and Riyad," and the third is a book of fables, "The Consolation of the Sovereign," illustrated by a Morisco in the 16th century.

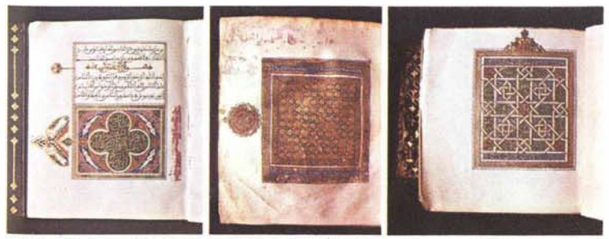
Even with the Korans it is often difficult to establish an Andalusian origin. Because of the close cultural ties with Morocco prior to the end of the 16th century there was constant interchange of population and it is difficult to decide whether an "Andalusian" Koran was actually written in Spain or whether it was written in North Africa by an Andalusian refugee—especially since the first to leave the conquered Kingdom of Granada were the noble families and the well-to-do, the natural patrons of the arts.

But as the art declined in Spain, it flourished in North Africa where in the 17th and 18th centuries painters turned their attention to many other works. Prominent among these was a well-known collection of prayers and devotions called Dala'il al-Khayrat, "The Indications of Grace," composed by Muhammad bin Sulayman al-Juzuli, who died in 1465. This work offered much greater possibilities to the illustrator, with as many as 60 illuminated pages, including paintings of Mecca and Medina and an elaborate genealogy of the Prophet. One of the earliest copies of this work was made in 1639 and at one stage belonged to the famous historian of Islamic Spain, Don José Conde (1765-1820), who inscribed his name in Arabic on the cover: "The owner of this book is Yusuf Antun Qunday. May God lengthen his days!"

The designs adorning religious manuscripts, however, were more than mere decoration. Attempts to create an ideal symmetry also indicate the feeling of a divinely ordered universe as if the artists were reflecting the perfection of the Almighty's plan as revealed within the sacred scriptures.

Although printing and lithography appeared in the Arab world in the 19th century, many manuscripts were still written and illustrated by hand, particularly prayer books and Korans. Illumination endured into the 20th century—as can be seen in the opening pages of a little book of prayers written about 1910 either in Morocco or Rio de Oro. But this must have been one of the last manuscripts to be so produced. Today it is an extinct art.

David James, who studied Arabic and art history at the University of Durham, is assistant librarian of the Chester Beatty Library and teaches at the National University of Ireland.



Left to right: Koran, 19th century, probably Algeria; opening page of a Koran, 14th century, Islamic Spain or Morocco; opening page of the prayerbook **Dala'il al-Khayrat,** circa 1750, Morocco.

PDSA

BY HELEN GIBSON / PHOTOGRAPHED BY NIK WHEELER

It's called the 'People's Dispensary'–but it's for Cairo's sick animals.

The tense, age-old drama played itself out in a dusty suburb of Cairo. A circle of faces gazed raptly at the glinting knives, the white-coated surgeons and meek assistants with sponges at the ready.

But this was a hospital operation scene with a difference. Sunlight filtering through green leaves lit the operating table, a canvas-covered platform. And the patient, steadied by thick ropes, was a mule.

The doctors worked through a dense cacophony of sound. The barking of 91 caged dogs and the neighing of two dozen assorted horses, mules and donkeys reverberated across the walled paddock in seeming sympathy with their prostrate colleague. After a large flask of anesthetic, the old brown mule could hardly have cared less. She lay on her side oblivious to everything including her own ugly leg tumor now being scraped and cauterized by head veterinarian, Dr. Wadid Abdel Malek. Later, she might rejoin the two million other draft animals on the streets of Cairo. In the meantime Dr. Wadid had prescribed the first holiday of her working lifetime—a month's recuperation in the adjoining stables.

The mule was just one of seven other draft animals that had arrived unannounced at the permanently open gates of this hospital the day before. These stood now in the stables encircling the paddock, awaiting their turn on the operating table or in the treatment pens, afflicted with the variety of ills that befall animals with a hard-working life on city streets.

Word of the People's Dispensary for Sick Animals (PDSA) has permeated the network of Cairo's cart-owners. They know they can get free treatment for their sick here, and possibly even some compensation for lost working hours. They arrive, sometimes up to 12 in a day, leading their sagging donkeys or even pushing the limping horses before them on flat carts.

The PDSA, a charity organization with about 1,000 clinics around the world, was born in Cairo. A sprightly English matron, a certain Mrs. Dickin, started the first dispensary in 1917 and was subsequently decorated by the King of England.

Now Dr. Wadid's staff is all Egyptian and one of his veterinarians also runs a busy dispensary in the working-class district of Boulac.

Rich and poor alike bring in their animals—47,000 cases were treated last year, of which 1,500 needed serious operations. Any and every animal is taken on, from monkeys to goats with smallpox, chickens with fowl fever and greedy donkeys with whole corn cobs stuck down their throats.

The hospital keeps financially afloat through donations from the PDSA head office in Britain, the Egyptian government and a kind of Robin Hood arrangement where the rich are made to pay for the poor.

Anyone that can afford to board out a pet, can afford to pay, is the vets' rationale. The fees from the 91 dogs, among them the Defense Minister's black poodle, some five cats and the gray parrot of famous singer Nagat Al-Saghira, all contributed toward the brown mule's operation expenses. Even the two dollars paid every month by a small boy for boarding his turtle helped.

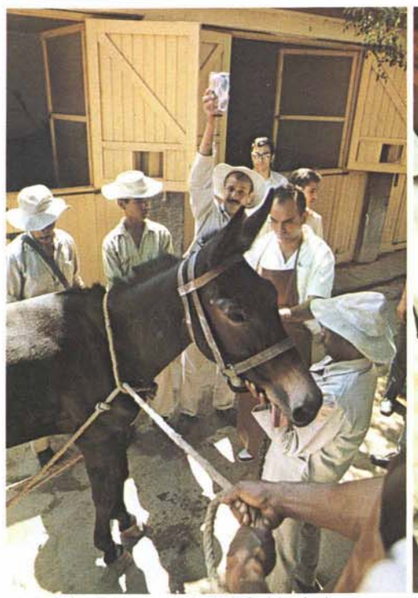
The presence of a rich man's dog in the hospital kennels usually means the owner is on holiday, whereas a donkey here could mean semi-starvation for a family. Some Cairenes still depend on the draft animal for their daily bread. Thus when Shenadi Negm's donkey fell strangely sick the man was desperate. He arrived one blazing noon and waited uncertainly at the hospital gates, his donkey rigid on the cart it used to pull. Now, after two weeks in the hospital, the white donkey looked healthier than its owner. Negm, a thin figure in a brown robe and white turban, stood beside the special treatment pen as he had done every day since the donkey was admitted. He smiled happily, and shyly produced a white paper from the folds of his robe.

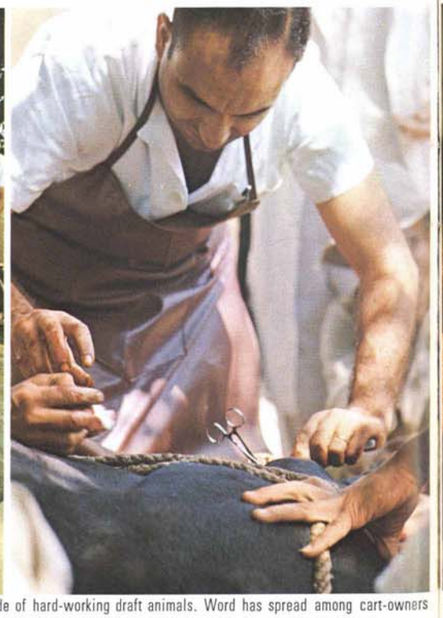
"Yes, he's laughing now, but you should have seen his face a few days ago," Dr. Wadid said dryly. "The donkey could barely move his head... tetanus, from a nail in the hoof. The paper is the donkey's discharge paper, 10 days from now. Until then, we feed the man, give him some money for his family and treat the donkey free."

Dr. Wadid, who would rather spend his day with the horses and donkeys than with the endless stream of pets that come into the "out-patients" examination room, turned to watch a chestnut mare led towards him. She could barely shuffle, her legs strangely bent apart, stiff as four stilts. Inch by inch she was guided into the shallow trough of healing liquids and tied fast.

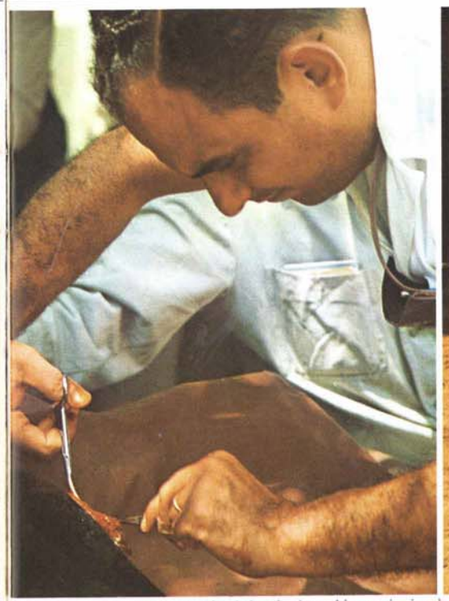
"I don't know that we can ever cure her," Dr. Wadid said sadly. "She has laminitis, an inflammation of the hooves. We did manage to save her foal, though, so that is one consolation. He had an infectious catarrh." The colt danced skittishly beside his mother, seemingly unconcerned by the long, healing scar across his neck and unaware of his own destiny of drudgery that might already have proved fatal to his mother. Sometimes Dr. Wadid knows from the start that the broken old case before him will never be able to pull its load again. He then gives it a stable of straw, plenty of good food and tender treatment for a full 10 days. Afterwards he puts it painlessly to death.

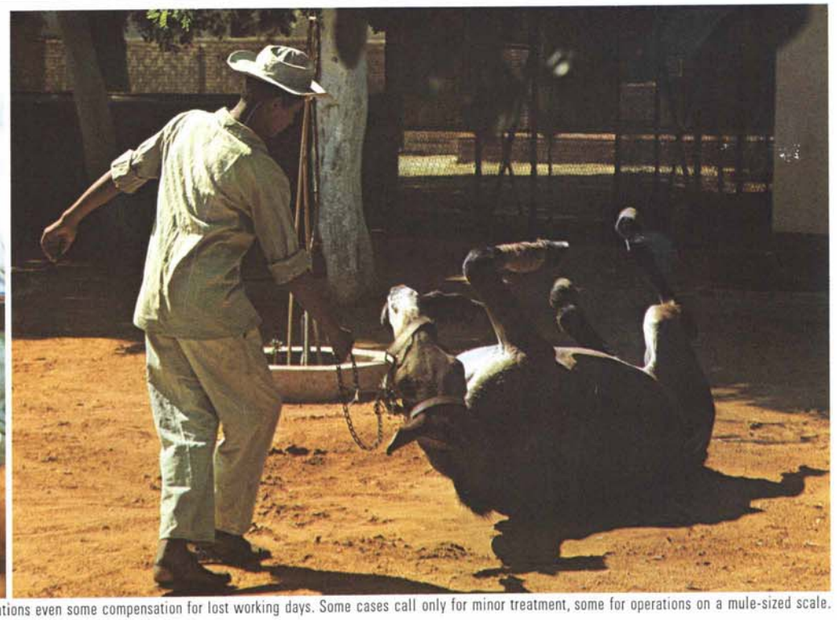
"I cannot do this to an animal, however





Cairo's PDSA clinic treats nearly 50,000 sick animals a year, many of them horses, mules and donkeys from among the city's multitude of hard-working draft animals. Word has spread among cart-owners that they can get free treatment for their animals and in certain situations even some compensation for lost working days. Some cases call only for minor treatment, some for operations on a mule-sized scale.





Veterinarian Dr Wadid Abdel Malek and his Egyptian staff performed 1500 major operations last year.

mercifully, without some reward for its working life," he explained. "And all our horses and donkeys in Egypt deserve one good holiday." Before Dr. Wadid can put a horse to death, the owner must first agree. The government will usually chip in with a donation of 25 percent of the animal's value.

Meanwhile, in the out-patient clinic, a yellow mongrel dog belonging to a young army lieutenant was sadly accepting a new series of injections and the indignity of having its temperature taken. It stood awkwardly, its newly-shaved hindquarters paralyzed from being hit by a passing truck.

When an owner cannot bring in his animal himself, a white air-conditioned ambulance goes to the rescue. A foreign donation, like the new X-ray apparatus, it also rounds up the starving stray dogs and cats that too often stalk the streets of Cairo like shadows.

These receive an overdose of anesthetic, then are buried in a corner of the hospital grounds. Unlike the rich men's pets such as "Bambino the Faithful" or "Dikxy Baby," with marble slabs to mark their grassy graves, the strays' deaths remain as obscure as their lives. There is no plaque, either, for the late President Gamal Abdel Nasser's Siamese cat, which is said to have refused to eat on the death of his owner and died himself 15 days later.

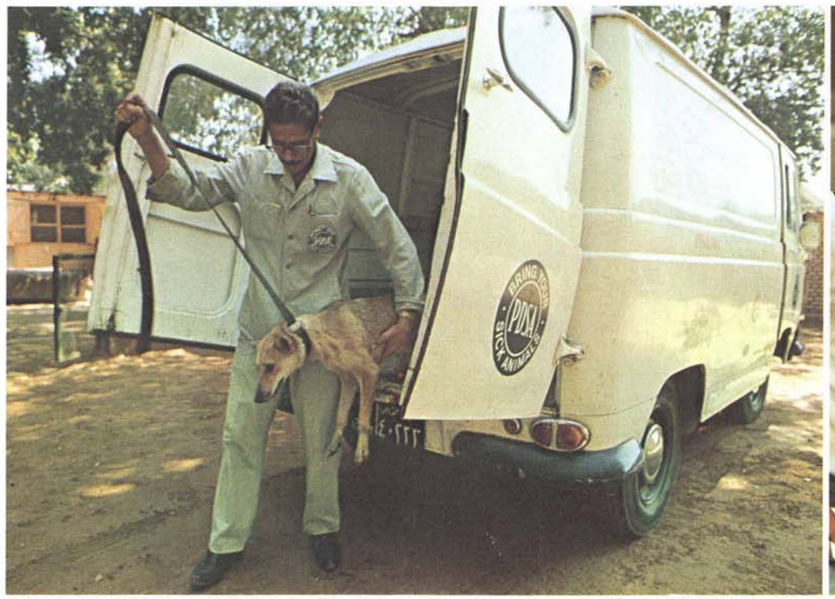
Perhaps most important of all is the work being done by the PDSA on the side—educating a new generation of Egyptians into giving animals a fair deal. The hospital insists many of the problems, particularly those of the draft animals, could have been avoided if treatment were given promptly. Mostly it is a question of ignorance—the owner vaguely believes the sickness will cure itself, or he is terrified at the thought he may lose his only source of income. In a few cases, the owner also is indifferent to his animal's plight.

Galal Sirry, nephew of a former prime minister, heads the Egyptian Society for the Extending of Mercy to Animals, as well as the PDSA's board of directors. A big man, he has thrown himself with infectious enthusiasm into promoting their cause. He tirelessly coaxes donations for the hospital in all directions, but his real interest lies in a "mercy to animals" program which, he believes, schools must start "at a very young age." Sirry backs up his crusade with quotations from the Holy Koran: "There is no animal in the earth, nor bird that flies on its wings, but (they are) communities like ourselves...," or from the Prophet Muhammad: "There is no man who kills a sparrow without cause but God will question him for it." At the same time he sends out thousands of "be-kind-to-animals" posters to Cairo's schools.

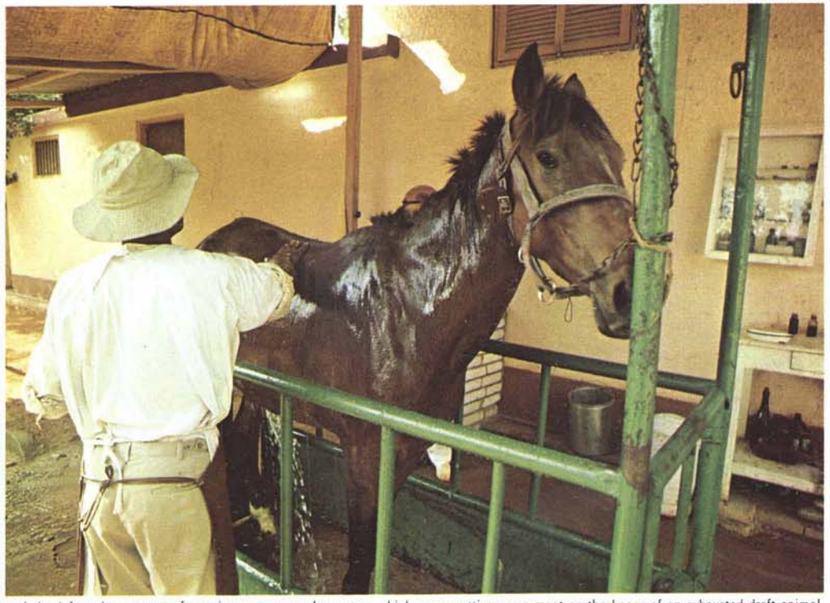
Sirry's great pride is the overwhelming response he had from children throughout the country to a painting competition organized by the World Wildlife Fund. He interpreted this as a showing of deep interest in animals by Egyptian children, and to his delight, they carried off several of the top prizes. Soon Sirry hopes to see some 750 schools in Cairo devoting 10 minutes in their daily hour of religious instruction to animal care. An animal club, which has enrolled some 700 youngsters, works toward the same end.

"We can only help such a tiny percentage of sick animals at the hospital," Sirry says, "What we need in Egypt is animal education."

Helen Gibson was a UPI correspondent in Vietnam and spent more than a year in the Middle East.



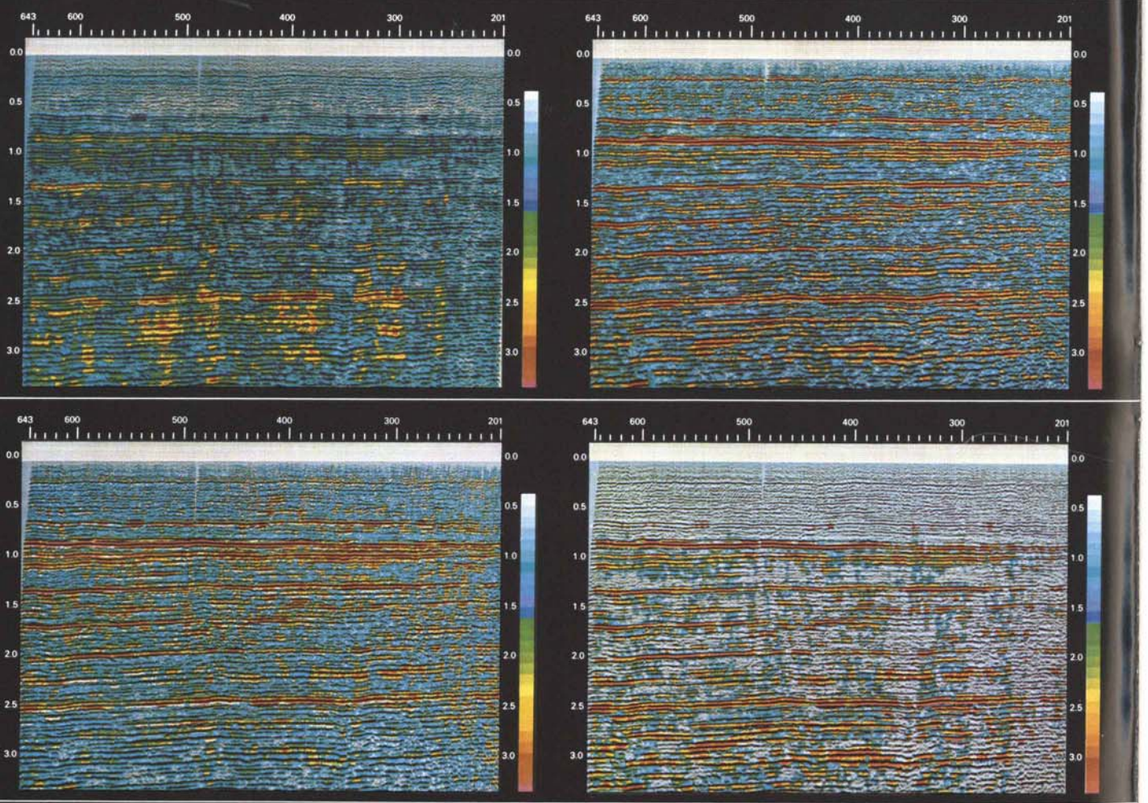
An ambulance is available to bring animals to the clinic. Monkeys, birds and turtles turn up, as well as countless cats and dogs brought in by concerned children or their mothers. The higher fees charged



for such pets—especially pets boarding because owners are on holiday—help defray the expense of treating a poor man's goat or chicken, or putting some meat on the bones of an exhausted draft animal.

Burnett H. Moody

To help Aramco decide where to drill for oil these powerful vibrators set off strong seismic waves which are reflected by underground strata and depicted graphically.



Good vibrations and turned-on color…

POSITIVELY EARTHSHAKING

BY BRAINERD S. BATES

Out in the broad expanse of the Saudi Arabian desert where everything is normally quite static, there has recently been a strange kind of movement. Five enormous vehicles, with their huge tires and oddly shaped but functional bodies looking from afar much like giant beetles, seem almost to be participating in some kind of outlandish, stylized dance. Lined up in oblique formation, they move forward a short way, pause as if straining at an imaginary leash, advance just so far, pause again, letting out another frustrated whine, then lurch ahead another time the same short distance. Maintaining near-perfect positions one on another, the five grotesque creatures inch their way across the sands, repeating their weird rite over and over for hours at a time, day after day.

Fantasy aside, these vehicles are engaged in doing some serious business, and they look the way they do because they're built to do it. A close-up look at the rear portion of one of the beetle-vehicles in action, for example just as it begins the "pause" cycle of its maneuver, helps explain the complicated mechanical structure riding on the chassis. A large flat pad is pushed down hydraulically by two thick, gleaming shafts until it touches the earth and this new surface contact slightly raises the rear wheels off the ground. During the brief period the pad is in this lowered position a bystander might sometimes feel slight tremors under his feet. The five enormous vehicles moving rhythmically across the desert in a line are real earthshakers, and what they are doing out there is making good vibrations to help the Arabian American Oil Company (Aramco) in its search for oil.

It is axiomatic in the oil industry that the only certain way to find out whether the earth under any given spot contains oil is to drill a hole and look for it. But it's an equally well-known fact that even under the most favorable circumstances drilling is a chancey—and expensive—proposition. For these reasons, over the years exploration experts have devised a variety of techniques which can tell drillers which location under the ground is more likely to yield petroleum than another (**Aramco World,** January-February 1966). Every one of these methods came into being to help discover the possible existence of cracks (faults) and dome-like porous structures (anticlines) in the subsurface having impervious coverings under which oil might be trapped under pressure. Figuratively, all the various techniques used to get this information simply try to take out a huge, deep slice of the earth and examine it in cross section.

At various times Aramco has used several different tools to help do this. One is the gravity meter, which measures minute variations in gravity pull caused by undulations in the earth's crust. A second is the magnetometer, used to gauge variations of magnetic forces. Astute interpretations of subsurface differences revealed by gravity meters and magnetometers can tell something about underlying structures. But while these two instruments are relatively inexpensive exploration tools, the information they impart about the earth's substructures is much less precise and reliable than that put out by the newer—and costlier—seismographic techniques which have now replaced them.

Seismo is derived from a Greek word meaning "shaking"; **seismographic** can be loosely translated as "writing shakes." Oil explorers send shock waves or impulses into the ground and measure with sensitive instruments the length of time it takes for them to be reflected back

Said Al-Ghamidi

On radioed command the vehicles first lower their pads until the rear wheels are off the ground, then begin to vibrate in unison.

Said Al-Ghamidi

to the surface. By studying the visual records made by these instruments a geophysicist can derive a great deal of structural information about the area being explored. Even in seismic exploration, however, techniques are constantly being refined and improved.

The earliest seismic exploration employed small charges of explosives to produce shock waves, creating what amounted to miniature earthquakes. Generating impulses by mechanical means is a more recent development. One method in this category uses a three-ton slab of steel mounted on the back of a specially designed truck and dropped in a vertical free fall at very brief, regular intervals as the truck moves along at a set slow speed. Another kind of sand-tired vehicle, advancing abreast of several others just like it, carries a gas-driven chamber which also delivers a sharp thump onto the ground. The vibrating earthshakers are the latest word in seismic exploration, and using them effectively is a complex operation involving a skilled team of men and a wide array of sophisticated equipment.

Early last summer an exploration party under contract to Aramco was working in an area far south of al-Hasa Oasis assigned to it by the oil company's Exploration Department. Aramco supplied the party—designated Seismo 7—with maps indicating the precise lines and directions it was to follow. A surveying team, keeping four or five miles ahead at all times, staked out the path in the trackless desert which the main body of explorers would be taking. Back down the line were those five vibrating units working their way fitfully forward in oblique formation along the route laid out. Buried just under the surface of the sand for some 13,000 feet ahead of the five trucks and 4,000 feet behind them were 96 "arrays" of geophones—altogether about 3,400 extremely sensitive receivers for picking up the impulses sent into the ground by the vibrators, all interconnected by a $\frac{3}{4}$-inch-thick cable containing 150 pairs of insulated wires. And somewhere out in front of the muscular earthshaking vibrating units was the nerve center, a recording truck whose windowless, air-conditioned body was jammed with computers and other assorted electronic equipment.

The vibrating units themselves are highly specialized vehicles designed to do one specific job and one job only—and look it. They come equipped with crab axles, and all four wheels are steerable for greater maneuverability. Both front and rear axles are driving axles. Power steering and full power shift transmissions are standard equipment. Their cabs are air conditioned, not so much for the comfort of the drivers as to pamper the small computers each carries inside. When the full 15-ton weight of these vehicles bears down on their vibrating pads, the section of ground on which they rest really feels their presence—"like grabbing a piece of earth and shaking it," as one member of the Seismo 7 party describes it.

The computer in each cab receives a signal from the recording truck which activates its hydraulic mechanism to lower the vehicle's 12-foot-square pad to the ground. Instantaneously the recording truck sends out a radioed command for the pads to vibrate in unison, beginning at a low selected frequency and increasing uniformly to a high frequency for precisely seven seconds to make one "sweep." After a six-second pause the pads make another simultaneous seven-second sweep in the same position before the vehicles advance exactly 15 feet during the next six-second interval. On their second station the vibrating units again make two sweeps of seven seconds each, with a six-second pause in between. Always obeying the radioed orders from the recording truck, and taking time out only for some such necessary detour as skirting the slipface of a sand dune and repositioning, the vibrating units stick to their 13-second advance-and-pause cycles from dawn to mid-afternoon, seven days a week. On their best days they can vibrate up a line as long as seven miles.

The action of the vibrating units is divided into 13-second cycles because this is precisely the amount of time the magnetic-drum memory core in the recording truck takes to make one revolution. The memory core continues to revolve until it has made from 12 to 16 records while the distant vehicles vibrate in six to eight positions. The records made during these revolutions result in one stacked, or composited, record which goes on a digital magnetic tape.

Just as a shortwave radio listener tries to tune out interference on his receiver to pick up a broadcast as static-free as possible, the geophysicist attempts to remove unwanted noises from his seismic recordings. Advanced seismic techniques call for an ever more sophisticated array of computers whose principal function is to filter out electronically as many undesirable noises as possible, noises such as those caused by wind blowing across the ground surface which are picked up by the geophones. Electronic equipment in the recording truck does some of the preliminary filtering. Later, the two or more tapes which represent a day's work in the field are sent to London, where highly specialized computers undertake more filtering and further enhance the seismic data by advanced digital processing involving the use of a selection from a library of 300 programs.

Early in the proceedings the auditory seismic waves reflected by the substrata are turned into visual representations—broad strips of photographic paper covered by squiggly horizontal lines which tell a significant story about the underground structures being examined to anyone trained to interpret them. Not too long ago, experts developed a sophisticated refinement of this basic technique. Vivid and distinctive colors can now be added to the visual cross sections, colors which are keyed to the varying compositions and alignments of such rocks as limestone, shale and sandstone which the waves pass through. To experts, the result gives the most accurate look yet at the "deep slice of earth" below the earthshaking vehicles, and the formations which might hold oil. To the layman its simply a turned-on, tuned-in electronic prism.

Actually moving a derrick to the site and drilling down deep into the earth is still the only way to "discover" oil. But these new forms of earthshakers, plus these increasingly accurate and easier-to-read visual "pictures" of the shock waves they generate, are making interpretations of these records ever more credible. Today, when a geophysicist looks down at a concession map, points and says, "This is where I think we should drill," the industry's decision makers, thanks to these new applications of physics, electronics and communications to petroleum geology, have better reasons than ever to take him at his word.

Brainerd S. Bates, a regular contributor to Aramco World, *is Aramco's chief writer on petroleum.*

"Probably people think I'm rather eccentric. You don't *know* what other people think of you, do you? But as you see I'm quite happy here."

A TALK WITH VIOLET DICKSON

WRITTEN AND PHOTOGRAPHED BY WILLIAM TRACY

For many years Violet Dickson was best known to Middle East hands simply as the wife of H.R.P. Dickson, the British Government's Political Agent to the Shaikh of Kuwait and author of the two monumental works, The Arab of the Desert *and* Kuwait and Her Neighbors. *Since Colonel Dickson's death in 1959, however, those interested in Arab-world places, events and personalities have come to suspect what Vi Dickson's wide circle of friends, Arab and foreign, have known all along: that she is a strong, vibrant woman, generous, witty, always curious, who has made ample contributions to Arab-Western friendship and understanding in her own right. Like her late husband, Mrs. Dickson is particularly known for her intimate knowledge of Bedouin customs and her love and respect for these proud nomadic herdsmen, both as people and as guardians of a vanishing way of life.*

Mrs. Dickson first came to the Middle East as a young bride in 1920. Before settling in Kuwait, she and her husband lived in Bahrain, Iran and Iraq, where they knew and worked with such well-known Arabists as Sir Percy Cox, Gertrude Bell, Bertram Thomas and H. St. John Philby. In 1929, when Colonel Dickson was appointed Political Agent, the couple moved to Kuwait and set up housekeeping in the same thick-walled, whitewashed, mud-brick house on the sea front where Mrs. Dickson lives today by courtesy of the now-independent country's ruler, Shaikh Sabah Al-Sabah.

In her recent book, Forty Years in Kuwait, *published in London by George Allen and Unwin, Mrs. Dickson told about the vast changes she saw come to the tiny Arabian Gulf shaikhdom, especially after the discovery of oil in 1933, and not just the obvious and much-publicized physical changes in town and countryside. Mrs. Dickson also wrote* The Wild Flowers of Kuwait and Bahrain, *published in 1955, and the desert flower* Horwoodia Dicksoniae *honors her botanical work.*

Violet Dickson was 76 in September. Bedouin friends often refer to her respectfully as Umm Kuwait, Mother of Kuwait, as well as Umm Sa'ud, after her son's Arabic name. They also, sometimes, address her as Hajjiyah, the honorific title of a returned pilgrim to Mecca, an unusual tribute for a Christian woman who has not, and cannot, make the pilgrimage, but perhaps the best sign of the warm feelings so many of the desert Arabs hold for her.

Mrs. Dickson, you came to live in Kuwait in 1929, when your husband was appointed as British Political Agent to the Shaikh. What were your first impressions of the city?

From the sea the town looked quite small. But you got the impression that it was a very clean town. The houses were all—not whitewashed—but done with white plaster. So from the launch that brought us to shore the view of the town was of the sea, the very nice white houses and a low hill rising up behind. All in all, it gave the impression of quite a nice town.

And what was it like up close?

Well, it *was* a nice town. And to me it was an interesting town. I remember how all the houses around us used to have one or two goats. It was the townspeople who kept goats, not the Bedu (Bedouins). And there was one man who would take them out in the desert to graze all day and bring them back just before sunset. Many of the goats would go home, each to his own house, and stand up and scratch the door. The rest would come to the yard and the children would be sent to go and bring them to the house.

There used to be a very nice lot of horses here too. The Shaikh himself had about 50 mares that used to roam in the desert. It was very pretty. You'd go out in the desert beyond the city walls at feeding time and you'd see them all coming in from various directions, to be watered or to get a meal. There was no more use for the horses once the car came, you know, but in 1929 there were only about three or four cars; the T Ford was the best. So everyone either rode a horse or a donkey. The merchants all came to work on the big white donkeys. They'd come trotting along the seafront here in front of the house, their riders often carrying an umbrella when the weather got hot.

The harbor was full of the big sailing boats which brought cloves and rice and tea from India and Zanzibar. The Bedu came in for their supplies, these things, and coffee. The marketplace, the open square, was full of people coming in from the desert, masses of camels, and they would load their supplies tied on each side, sacks of food, tins of kerosene.

And there were still caravans crossing to Mecca at that time. The pilgrims were still going in baskets on the sides of the camels in little covered seats. They sat cross-legged in there, one on either side. The guides led the women's camels, walking all the way. Of course the camels didn't march head to tail the way you'd imagine. They just went on grazing most of the time.

That was quite a walk!

Yes, it was. Today you wouldn't find anybody who'd do it. Not even a Bedouin. They used to set off long before the time of the pilgrimage so they could stay longer in places where there was good grazing for the camels.

How did the Bedouins in the desert earn money to buy their coffee and other supplies?

They would bring in a few camels to sell for slaughter, and also wool from the sheep. There was quite a big market for sheep's wool, and in those early days, of course, there was very big trade in astrakhan, the skins of young lambs which they killed when they were only about five days old. Astrakhan, tight curls of black wool. They'd export them to Europe. All black, the Kuwaiti sheep were. Not now; you hardly see any of the black ones today. Their skins were very valuable. So the Bedu brought those in and the women wove little rugs which they also brought in for sale. Today you see very few of those either.

And they would bring in brush for firewood. There was no firewood here, and everybody had to cook on wood or palm fronds. There was a big trade in palm fronds cut and brought in here by boat from Basra in Iraq. There were a lot of ships going and coming all the time. Dates and green fodder and fruit and vegetables. In those days nothing was coming across the desert from Lebanon or Syria. Nothing. It all came down the Shat al-Arab River from Iraq.

Life here then must have been very simple. But you always managed somehow to keep a comfortable home for your husband.

Well, yes. We made do. Of course, when we first came in 1929 the only foreigners here were my husband and I at the Political Agency, the agency doctor and his wife, and a small staff of four or five at the American Mission Hospital.

We didn't have electricity, just paraffin lamps. But the American Mission had already got some little engine that they used for their work, so after a few years we also got one from America, and it did our house and the agency doctor's house down the road. We turned it on at sunset.

For food, why when we came back from leave—by ship, then—we'd bring a whole year's supply of certain tinned goods with us. And we had little gardens. Radishes, plenty of cucumbers, plenty of melons. There were little shallow wells, just outside the wall of the town. Not more than six or eight feet deep. Each well served maybe four little garden plots. Sweet. If you went deeper it got brackish. And I gave our gardener some cabbage and cauliflower seeds which I brought from England. Potatoes came up on the mail boat from India and fresh drinking water was brought from the Shat al-Arab. There were special boats with water tanks fitted into the hold, exactly the shape of the boat. Then there were carriers who went wading out on their donkeys with skins to fetch the water. We bought ours from a man with tins on a yoke across his shoulders and put it in a tank in the yard, about 25 four-gallon tins a day.

Kuwait really had two faces, didn't it, one turned toward the desert and the other the sea?

Well, actually the only wealth of the town in those times was from the sea—the pearl diving. It was all they had. There were special boats called *hawasha* which took people anxious to go out and buy from the actual pearling boats. Merchants would come up from Bahrain and the French pearl merchants came up from Bombay to Bahrain and bought pearls there. The remaining pearls would be brought in and sold along the seafront here in Kuwait. You'd walk along the front and there'd be people selling them or you'd walk in the bazaar and a man would produce one out of his mouth and say, "Do you want a pearl?" He'd pop one right out of his mouth. If he put it in his pocket it might roll out or something.

I suppose diving was considered a very difficult job.

Yes. They say it used to affect their ears quite a bit. Before they went on the dives we'd often see men who were sitting and having blood taken from their heads. There was sort of a little glass tube, heated, I think, and a man cut them with a razor and drew out blood with it. They thought it would help for the pressure. Today, of course, you'd never see such a thing.

It must have been quite interesting, living here on the front.

Oh, indeed! I used to watch them put up the big boats for the summer. They cleaned them up and they'd take the sails into these one-story godowns—warehouses—along the front. You'd see the men running across the road with this sail wrapped up just like a great serpent, a sea monster, about 15 or 20 men carrying it and running across the road.

Another thing I miss today that I always used to enjoy so much was the singing of a spring evening when the pearling fleet was in. The crews would sit on their boats which were pulled up in front of our house and sing their pearling songs away into the night, when we perhaps would have already gone up to sleep on the roof, or often when we were having dinner up there. The pearling songs have all gone from Kuwait now. You don't hear them on the front any more, though I think the late Shaikh had recordings made of them. They say occasionally they put them on the radio, but I haven't heard them.

Didn't the Kuwaitis also engage in trade?

Oh, yes. They would go on long voyages to India, East Africa, Zanzibar. I think the first year we came to Kuwait there were about 400 boats which went out. They'd start in September, calling at Basra for dates, then going down to India, discharging the dates, taking another cargo across to East Africa and then down to the Rufiji River. The winds brought them back about the beginning of April. They laid up these big deep-sea boats and they had just about two months with their wives before they went out again on the 15th of June. Then they went off to the pearl banks and didn't come back until about the 26th or 27th of September and then off to Basra to get dates and then off again.

From olden times the Kuwaiti was really much famed for being a sailor, a good sailor. They knew all the reefs and knew the winds. Kuwaiti captains would only sail with a Kuwaiti crew. They wouldn't take anyone else, because, they said, "We might get to Mombasa or somewhere and the other men might just go off and leave us." They knew with a Kuwaiti crew they were all waiting to get back home to their families here. It was only after the oil came, when people thought they would earn as much money working in the oil fields and didn't want to go to sea, that gradually all that seafaring trade came to an end. There is no pearling now. None of the young men want to dive today, no one wants to go to sea. There are still a few merchant ships, but mostly they just sail across to the Persian coast or down to Muscat in Oman. And some of the big old wooden ships which have been sold come in occasionally for overhaul, and they still repair them here. West of the city there are small yards where they still make a few shrimping boats and some pleasure launches, but I don't know how long that will go on.

Wasn't boat building an important industry here once?

It was. They used to build many big boats. The Indian Ocean boats were all the big *booms* and the *bugala*. The pearling boats were smaller, *bouks* and *shawaize*, and the captain of the pearling fleet used the *bateel*, another special type that no longer exists.

The ships all used to be made in the yards here along the seafront, so they could launch them on a high tide. On the return journey from East Africa some ships brought mangrove poles which grow there and others would bring back boat-building wood from India. They would bring back all the natural bends for the ribs of the boats and the keels. They would sail in here, unload the wood and float it ashore.

When we first came here there were about four old wrecks in the sea, iron barges, their broken backs sticking up out of the water. We'd go there of an afternoon and the children at low tide would climb into them looking for crabs and barnacles. Then many years later when World War II came, the men who were making the big wooden boats and the pearling boats were desperately short of nails. They'd been getting them from

India and now everything from India was shut off. So the builders went to the Shaikh and said, "If the government doesn't want those old metal barges we could break them up and make nails out of them." The Shaikh said, "Nobody wants them. You can do what you like with them." So after that, day and night, whenever there was a low tide there were about 20 men there hammering and banging and cracking away until they broke those barges all up and made nails for making boats during the war here.

What about the desert, Mrs. Dickson? And the Bedouins? How did you first become interested in that facet of life here?

I guess it started with small trips to visit the Bedu. Usually in the spring my husband would take me and the two children out and leave us with some Bedu friends for a week. In those days there wasn't much to do here for the children. We'd catch desert mammals, hedgehogs, jerboas, and chase grasshoppers with a butterfly net. My daughter eventually had both a grasshopper and a beetle named after her. Then we'd have picnics, and we'd ride the camels, and we'd go visit this tent and that on the camels, and have coffee. The children would play with the Bedu boys and ride on the donkeys. Eventually, we even had our own Bedouin tent. It moved with our friends with their camels. They kept it for us. At one time we thought it would also save trouble if we left our bedding with them but that wasn't a success, because of course when we weren't there they used it. They're accustomed to sharing everything. Then when we did get there we found it full of things, so that wasn't such a good idea. And there was nothing like DDT then.

When we were leaving we used to ask our friends, "Now where are you going to camp next week?" They never stayed in one place longer than perhaps 10 days maximum, and then they would move. And they would say, "Well, we think we shall go to such and such a place." They would always choose a place so they couldn't be easily seen, behind a hill, because they lived close to the main trails to Kuwait and there were always travelers looking for a tent where they could just go in for the night or spend a few days before going on. But every stranger that *did* come was welcomed. "Welcome and come in," they'd say. "Dinner is ready."

Yes, that is the story that one always hears, but in your experience is it really true?

Definitely true. I think Bedu hospitality must be a response like ships meeting at sea. Without it there was no other means of getting from a distant place in the desert to the town to purchase supplies. Travelers also carried news, and they knew that all the way along they could spend the night in someone's tent. They didn't *always* get a lamb to eat, but they could have rice and milk and butter and then move on. You could travel in the old days right across Arabia without taking any food with you.

Once in the desert with my husband we met a Bedouin on a camel and asked him, "Where are you off to?" And he answered, "I'm going down to Najran." That's hundreds of miles away, in southwest Arabia. He said, "Two years ago a man came through here from Najran and came as a visitor to my tent and I gave him a dinner; so now I'm going to go down to Najran and find him and have dinner with him."

You've mentioned supplies, and of course the Bedouins had their animals. I'm also curious about game. Was there good hunting in those days?

Not really. We used to go with the Ruler's hawkers to hunt hubara bustard, lovely big birds. But even in those days there wasn't much else in the way of game. The shaikhs sometimes shot gazelle, and when we were with the Bedu their salukis, greyhounds, would often catch a hare or two and we'd have them cooked for our evening meal. Salukis had special status. They were allowed to come into the tent. A sheepdog is considered an unclean animal, but the saluki, no, because they catch your food for you, such as hares. So they can come in and lie down inside.

The Bedu love their salukis. There was this one tent ... it's a sad story. A friend of ours had this female saluki which he was very proud of. She would go out every morning and every evening she would come back and in her mouth bring a hare for them—every single evening—and they would cook it and give her some little bits of it. But one day the wife left her new baby in the tent. In those days they wrapped their babies up in swaddling clothes and put them on carpets on the ground. Well, this nice little greyhound came in and lay down beside the baby. It must have rolled over, or she must have ... anyway, later when they went to pick up the baby the dog had lain on it and the baby was dead, smothered. They didn't know what to do. A few days later a party of traveling Bedu came through and stopped at their tent and the father said, "I'm going to give you our best saluki." They wouldn't kill it, they couldn't kill it. So he gave her to this family of Bedu who were going on down into Arabia and not coming back.

Do the Bedouins repeat such stories?

Yes, they do. They remember them. I sometimes see this man. He lives now in a village west of the city.

For all the romantic tales of nomads and black tents in the desert, life for the Bedouins must have been hard in those days.

Yes. Water, for example, was always a problem. When the oil company first came, my husband, when he was hired as an adviser after he retired from government service, insisted they dig some water wells out in the desert for the Bedu. They did put two or three, deciding on a windmill type. But in hot weather when water was most needed there would be a month when there was no wind, and water would have to be sent out in tank trucks. Or the Bedu would climb up the rigging and try to turn the wheel by hand to get a bit of water. Occasionally something would break and then the man in charge would have to gallop into Kuwait two days on his mare to inform my husband. In a bad year, during the summer months there were always one or two cases of people practically dying of thirst in the desert. Perhaps they had run out of water, or a camel had fallen, unable to go on anymore.

And there were sandstorms?

Oh, yes. I remember one time we took a visitor out to camp and a dust storm came up very suddenly. We looked around and—well, I thought it was a bush fire. It was exactly like flames coming along. But of course there weren't that many bushes to burn. The Bedu saw it too and rushed to the tents quickly and took away the poles to make them fall down, and then rushed to our tent and lowered all the poles. It came on us as a howling storm and we were all frightened, in under the fallen tents. It lasted, I suppose, about an hour and a half. When it had passed on the air was all clear and quiet. But it was scarlet sand. It must have come from far far away to the north, and today the Bedu talk about that as "the red year," because of that strange red storm.

What about locusts? Weren't they also a plague?

For farmers in the oases, yes, but not for the Bedu. They said that whatever had been eaten by locusts came up again even better than before. The grazing was better after.

We used to sometimes have locust plagues in the early spring. I remember one day in the market square when it began to get a bit dark. We suddenly saw these great big hawks and vultures flying up in the sky. They were attacking locusts, and this swarm came over until it almost darkened the whole sky.

It went on from that year; I guess it happened almost once a fortnight in the winter and spring. Clouds of them would come ... and if they got here toward the evening they'd settle on bushes. After the weather got a bit warmer and they'd had good food and after there'd been a rain, they laid their eggs in sandy places. Then as soon as you got the next shower of rain, out would come all these hundreds of young hoppers. First it was a little patch, but every day it would get bigger and bigger and hop further and further until the whole place was a seething mass of hoppers. The flying locusts would have gone on, but then the hoppers came. I've seen them coming over the city wall just like an army. Like this, black! Coming up on the wall and down over, and falling into the wells and into the drinking water. They came into your house; they ate the curtains, they ate everything they came upon. If you drove through them with a car and crushed some of them the others simply came along and ate up all the crushed ones.

But with flying locusts the children had a grand time. They'd take off their *gahfiyahs*, head scarves, and knock the flying ones down and catch them. And the great delicacy was to catch the females before they laid their eggs, when they were still full. Everybody would catch them, and they were selling them in the marketplace. They'd cook them in boiling water and salt. When I went calling on ladies here they would always bring a tray of fat boiled locusts and take off the heads and the legs and the wings and then offer them. The Bedu dried them on their tents and kept them all year. The salukis ate them, the donkeys ate them and the people ate them. The Bedu were really happy when they came.

That surprises me. I always thought they did so much damage.

They did when they got up into Iraq where there are fields of wheat and barley. They ate everything. But the Bedu didn't care about what happened up there. They were very sad when the locust control came to poison and destroy them. Not the farmers, but the Bedu, because they relied on them in those days, really, as a source of food, of protein.

Is the life of Bedouins changing much now?

Yes, their whole life is changing. Faster than I really ever thought it would. Originally in the reviews of my husband's book, *The Arab of the Desert*, many of the critics said, "This book will be a lasting record, because all this is going to go fairly soon," and I thought, "Well, no. I don't think it is going to go that soon." But it *is* going, and very rapidly now.

Take camels. Originally the economy of the Bedu was based on the camel—when there was a market for them as a means of transport. And the Bedu couldn't have many sheep because sheep need water every day. But now that's all changed. After the war everybody began to buy pickup trucks to drive to a well and fill up drums of water for the sheep. Today lots of tents even have a lorry, a big truck. They've gone from pickups into big lorries. And some Bedu have even bought tank trucks so they can go far away for water. And now they're getting short of young men to look after animals of any kind. That's their next trouble. Gradually as the oil

companies have increased, they're taking the young men into industry. The young man's ambition is not to look after sheep, it's to drive a motor car. You can't really blame them. And so they come into town.

The old tent life is changing too. About four or five years ago the word went out somehow that women should no more spin and they should no more weave. I don't know why that was. This sentiment just sort of spread. Perhaps they felt they should be more ... well "educated." One doesn't know how it started. But I'd go out to the tents, even far out in the desert, and the women were not spinning. Always before, sitting by the fire in the evening, the old women would be spinning their wool. And what was happening also was that Syrian manufacturers were exporting tent strips made to the same width that Bedu had always used for their black tents, made in factories by the yard. So if you wanted a tent as long as this room you just measured it off and cut off five strips like that and the women sewed it together and they had their tent. No need to spin any more. They sold camels to buy these strips.

But they were very badly woven, very cheaply woven, and although they were wool they were too thin. They weren't protection from either sun or rain. So a lot of the tents have fallen apart, and now they've got burlap sacking pieces on the back or they've got bits of white sailcloth on top of them. This last '*id* holiday, for example, when I was in the desert down in Arabia, it rained for two solid days and nights and sitting with the Bedu in their tent, I saw the water dripping through the whole time, through these thin machine-made strips.

Do you think nomadic life as you've known it is ending?

I think in Kuwait, definitely yes. From the tents now, many have moved into huts and little shacks on the outskirts of the city. At first they keep their tents because in the spring they still want to get away into the desert. But now the government is building rows and rows of low-income houses to remove all these shantytowns and to put the people into houses. Well, that's the end of the nomads. I suppose the young think that it's a step up to move into a house, but the old people are quite miserable. They feel trapped in there. And a Bedouin woman never had to learn how to keep a house clean. She'd no idea. She didn't really sweep or anything, because she could just move their tent and get on a clean spot. And the houses mean that they can't keep an animal, they can't have a goat. They have to live on tins of powdered milk.

Is this modernization having other effects?

Yes, even on the desert itself. When all the building started in the city the contractors quickly exhausted the nearby quarries for new jetties or roads. Then they discovered that there were certain places in the desert where there were a lot of pebbles on the surface. So some poor nomads started sweeping them up and trucks would go out to collect them. Now those sections are practically denuded. All the gravel has been swept from the surface and it's a dust bowl where hardly anything grows. There's nothing left. People have said to me, "Where exactly is that one place you mention in your flower book? We've been out there and we didn't see any of that flower." And I answer "Well, no, you *won't* see any. They're not there anymore. They've just disappeared."

You still collect wild flowers to send to Kew Gardens, and you've even had one plant named after you. Did you realize you'd discovered a new species when you first found it?

No, I didn't. Because it was so widespread around here. I wasn't even thinking of that, really, although I'd read that the ambition of all starting botanists is to find something that has never been found before. But this plant wasn't rare here at all. It grew up under a larger bush and came out at the side all in flower.

What about your second book, your biography, *Forty Years in Kuwait*, which was published not long ago? How did you come to write it?

Strangely enough, it has echoes of James Bond. You see, the Kuwait Oil Company got Ian Fleming to come out here from England to write up a book for them, a company history. He came out and interviewed everybody in Ahmadi, the oil town, and then one day he came to the city and asked me a whole lot of questions. Then he said, "Why don't you write something?" Well, if somebody says you've got to sit down and write a book it frightens you to death. But he said, "You only need to sit down for an hour a day and you'll see what a lot you can write if you just write up the odd story." Then somehow it didn't seem like such a large task.

Now that you've finished your book, how do you spend your mornings? Do you have a lot of correspondence?

Usually I try to do calls in the morning. There are certain mornings when some of the Arabs "sit." Do you know this expression "to sit?" Sit in *majlis*. The coffee is going, and the tea, and everybody pops in and has a cheery chat. Women aren't supposed to go, but my husband used to do it so regularly that after he died, I said to myself, "I feel that now that he's not here perhaps I should go." And they all welcome me.

I go to the Ruler's *majlis* sometimes too. He sits in public *majlis* where anybody can come in from 8:20 to 8:45 every morning. He's not there to solve any problems, really; that custom died out when they formed the National Assembly.

Especially it's the custom on the '*id* holidays to "sit," and on the first morning, after the Ruler goes past in his car to receive his congratulations in the town palace, I go and call on my neighbors, the various houses, and sit with the men in their *majlises* and wish them a happy '*id*. It's not meant for women to go, but they accept me because I've always done it.

How did you first meet your husband?

After the first war I was working in a British bank in Marseilles. He came into the bank off the ship on his way to England from India and asked if he had any letters and changed some money. Three months later, when he was returning from leave, he came back to the bank and again he asked for letters, cashed a check and talked to me for a while. Then about a week later he sent me a cable from Port Said saying wouldn't I come out and marry him? And I talked it over with some friends and then accepted and met him in India.

And as soon as you reached India your new husband was transferred to Iraq, wasn't he? How did you like Iraq?

I found it difficult. Harold was very busy in his office all morning and it was my responsibility to try to cope with servants, not knowing a word of Arabic, and tend to the grooming of the horses and care for the other animals. It was very difficult.

Of course, gradually you picked up Arabic and those problems worked themselves out.

As I say in Iraq I didn't know any. But I started to pick it up when we were in Bahrain for a while and then when we came here, by having our own Bedouin tent and going out and spending a week or more with the Bedu. Now I'm fluent enough in Kuwaiti Arabic, but if anyone talks a high-flown Arabic then I'm still rather at sea.

When did you first begin to realize that not only could you manage to live in the East, but that you were growing to love life here and were going to make it your permanent home?

Really, I think, not until I came here to Kuwait, after 1929. There were the townspeople and there were the Bedu, and they were all friendly. Then gradually I became interested in my hobby with flowers here, and there were some very good years of rain and we did some camping with the Bedu and here I still am, you see. Looking back I find all my friends are . . . who are my friends here? Why they're people in all walks of life. All the policemen, all the coast guards are my friends. I don't go to women's coffee parties. Nothing could induce me to. But I go and sit of an evening and chat with the boat repairer on the front or I go to the coast guard post out on the spit and sit with them having tea and coffee, reminiscing about the old times. Probably people think I'm rather eccentric. You don't *know* what other people think of you, do you? But, as you see, I'm quite happy here.

The British Government didn't think you were just an eccentric. Hasn't the Queen awarded you the CBE (Commander of the British Empire)?

Yes. That was in 1964. One day I was just sitting in the office and the telephone rang. It was the Political Agent and he said, "Hello, Vi. I've just had a telegram asking me to ask you if you will accept the CBE." I said, "What?" He said "Will you accept the CBE?" I said, "Are you joking, Noel?" He said, "No, I'm quite serious." "Well," I said, "Really, you're asking if I accept it. Of course I'll accept it if you're not joking." He said, "No, I'm not. All I want to know is if you'll accept it." I said, "Well, yes, thank you very much." Then later I got an invitation to attend the investiture in London and the oil company offered me a return air ticket.

Was there a citation with your CBE?

No. You don't get a citation. One rather wishes one did. People say to you, "What did you get it for?" And you don't really know. I presume as much as anything it's just for being friendly with the Arabs here, and liking them. My Arab friends come and ask me to show the medal to them, and the signature of the Queen. It's given me a sort of prestige, living by myself, really. They appreciate my having decided to remain here. You're one of us now, they say, a *Kuwaitiya*.

Mrs. Dickson, why do you suppose the Arabs are sometimes unpopular in the West today, misunderstood? In your husband's preface to *The Arab of the Desert* he refers to them as "one of the proudest and most lovable of all people."

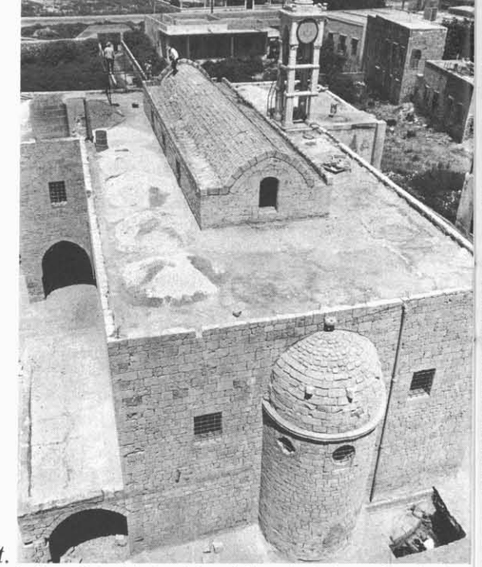
I don't know. Do you suppose it's because of history a hundred years old, that people think they treated their women badly or that they had slaves? Do you think those ideas have lingered on until today? If they have, those people simply haven't had the opportunity to come and meet the Arabs in their own homeland. When the Arabs travel more and when more Westerners come here, they'll see how friendly and hospitable and kind Arabs really are.

William Tracy is Assistant Editor of Aramco World.

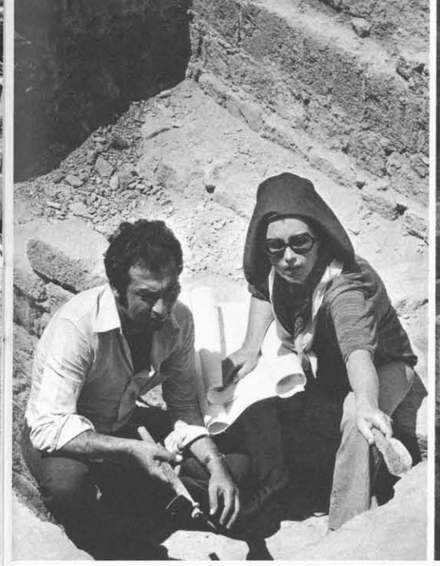
A Wedding in Tyre

BY DIANE WILLMAN

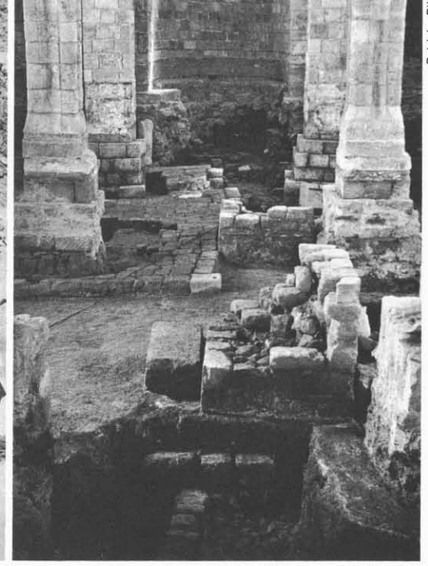
"Do you dig me?" asked the archaeologist. "I do," replied the archaeologist.



St. Thomas' church in Tyre (above, left) was in a bad state of repair when



young archaeologists Patricia Cecil and Pierre Bikai (center) began restorations and discovered Crusader foundations beneath the floor.



Patricia Bikai

PHOTOGRAPHED BY KHALIL ABOU EL-NASR

The two archaeologists just couldn't agree. All of Patricia's calculations indicated the buried Crusader church had to face south. Pierre insisted emphatically that it faced east.

So she dug.

And he dug.

And they discovered the church—right where Pierre said it would be—then another one beneath it. By that time they had three churches, so they decided to get married in one.

And last June they did. But the story of Patricia Cecil, an American archaeologist working in Lebanon, and Pierre Bikai, Lebanese director of the Roman city excavations in ancient Tyre, began many months before, back in June 1970.

They'd first met at a "dig" outside the village of Sarafand, on the Mediterranean coast between Beirut and the harbor town of Tyre. Patricia, a graduate student in archeology at the University of California at Berkeley, had been offered a place on the Sarafand team of the University of Pennsylvania's Dr. James B. Pritchard. At first she turned the job down because she hates flying, but a verbal shove and a goodly supply of tranquilizers from her mother finally got her on the plane to Lebanon. Of course, Mrs. Cecil had no way of knowing then that she and her husband would be taking that same flight to their daughter's wedding barely two years later.

Pierre, who studied at Beirut's Institut des Beaux Arts, serves as architect at the four-year-old Sarafand excavation when the dig is underway each spring. The rest of the year his job is directing the unearthing and reconstruction of the Roman level at Tyre, one of a number of periods being uncovered at the vast site, a painstaking task that could eventually take decades.

With the two young archaeologists working on the same dig at Sarafand, a historically important site, but a small one, it was inevitable they come into daily contact. But when they did they always discussed archaeology—naturally. It wasn't until a mutual friend happened to invite them both to dinner that Pierre asked Patricia for a date. And where does a boy archaeologist invite a girl archaeologist when they go out?

To a "dig" of course.

So they drove south to Tyre and wandered through the Roman city excavations, then over to the nearby necropolis. Beside it stands the most complete reconstruction of an original Roman hippodrome anywhere. At one end a group of Lebanese army officers posted in the area were training their horses to pull replicas of Roman chariots in preparation for a planned tourist festival in the ruins. Patricia sat on an immense stone slab which was part of the restored grandstand and watched a scene reminiscent of one Roman officers and their ladies must have witnessed from those same stones some 2,000 years before. The chariots swept down the long, straight run, a pall of dust rising up to the banks of seats as they rumbled past, then on to an arcade of columns at the far end of the hippodrome where they wheeled sharply about. The noise of chariots, men and horses echoed down the centuries.

"When a man orders up a chariot race in a real Roman hippodrome just for me, I'm won," Patricia says today, grinning. "That was it." A few months later, Pierre flew to Los Angeles to meet her family. Word soon got around that he would like a word with Mr. Cecil, "in private, please." That Christmas, the couple became engaged.

In Lebanon, meanwhile, the Department of Antiquities was considering a proposal to restore the Greek Catholic church of St. Thomas at Tyre, a well-proportioned stone structure of uncertain age tucked away behind latter-day dwellings and shops at the end of the peninsula not far from the sea. The historic church was still in use, but in a poor and weakened condition. Early in 1972 Pierre and Patricia were chosen as a team to supervise the restoration job, which at first consisted mostly of chipping off the vast quantities of bilious-pink plaster added to the fine interior stonework over at least two centuries. Then the department's director-general, Emir Maurice Chehab, decided that as long as the church was being torn up anyway, it would be a good time, perhaps the last opportunity for a long while, to have a look at what lay beneath St. Thomas'. In the Middle East, temples, churches and mosques are frequently built on sites held sacred by numbers of earlier civilizations, and in Tyre there is some relic of the past under practically every modern building in town.

Patricia did some reading and found St. Thomas' had attracted the attention of an 18th-century English traveler to the Holy Land. In his *Description of the East and Some Other Countries*, published in London in 1745, Richard Pococke noted that when he visited Tyre he found it shriveled from the grandeur of Phoenician, Greek and Roman times, little more than an obscure fishing port.

"I saw also," he wrote, "some granite pillars which they say are the remains of a church dedicated to St. John; and near it is the ruinous church of St. Thomas, part of which is repaired, and serves as a church for two or three Christian families that are there." But the present St. Thomas' church, Patricia reasoned, would hardly have been built by two or three families. It was too elaborate, too grand. When it was decided to take a sounding in search of earlier foundations, a process involving digging a narrow hole straight down, Patricia suggested digging just outside the south wall of the church. Pierre disagreed.

"The trouble with this method of exploration is that if you happen to sink a hole in the middle of a buried building you might never find a trace," Patricia explains. "But since you usually can't afford a general excavation you make a shrewd guess, take several soundings and cross your fingers. That's what we did."

In one shaft they uncovered an archbishop who had been buried sitting on his throne. Then inside, under the sanctuary of the church they found another five archbishops buried in one big crypt, a discovery which led to much theological to-ing and fro-ing by local church dignitaries before it could be decided what to do with the remains. Meanwhile, much of the modern church's stone floor was removed and excavations went on carefully around the archbishops. Finally, with a good deal of pomp, they were disinterred and placed temporarily in a simple wooden coffin which Patricia helped ready at the last moment, an unusual task for an archaeologist.

"I was still spraying on the last of the black paint from a spray can when the dignitaries arrived for the ceremony," Patricia remembers.

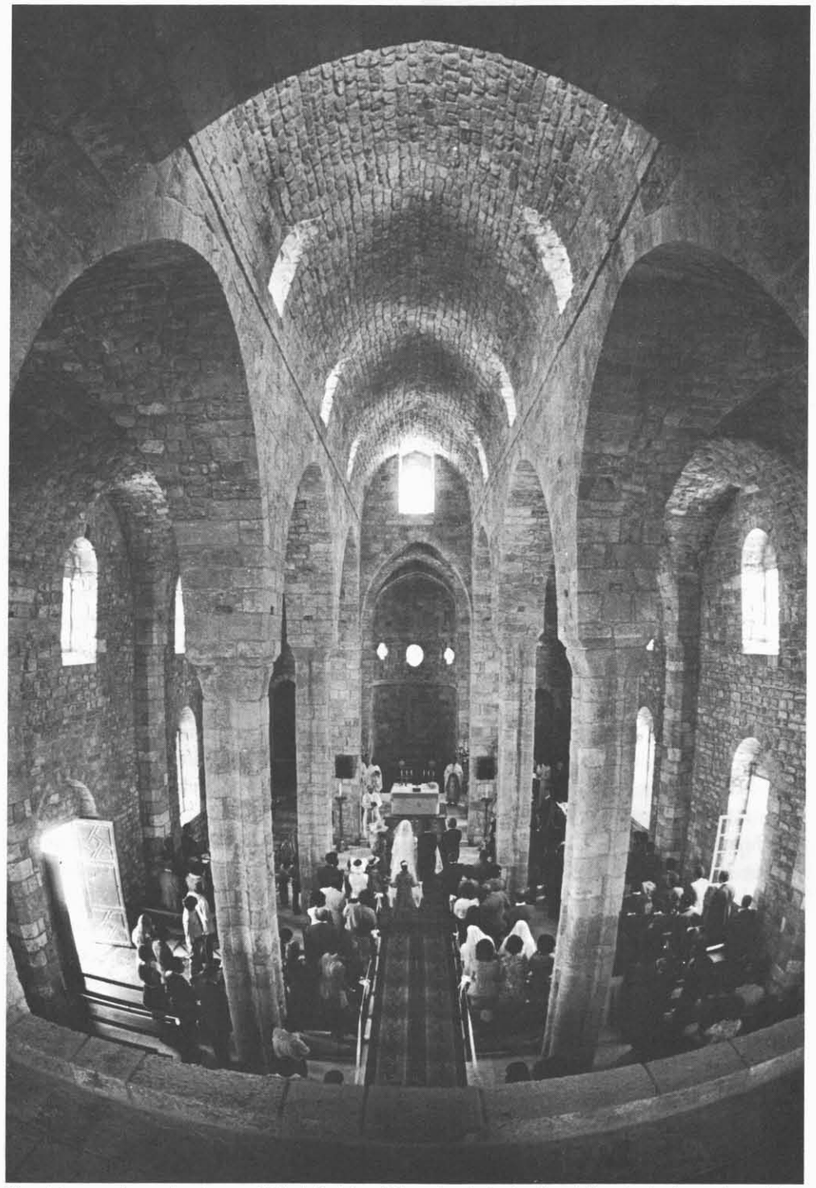
The explorations continued until it became clear there was indeed a Crusader church under St. Thomas'. The foundations faced east, exactly as Pierre had predicted. That argument settled, the two decided this was most probably the church Pococke had seen and described, rather than the present church. The St. Thomas' of today, they now believe, was probably not built until about 1760. As digging continued and the entire floor was stripped away, it became clear that the later builders had known about the Crusader church and had used part of its walls for their foundations.

What remained of the earlier church slowly emerged from the earth. In the excavated debris they found Crusader inscriptions which included interesting details on passing pilgrims who had happened to die in Tyre on their way to or from the Holy City of Jerusalem and were buried in the church. Eventually some of these inscriptions will be given a place in the restored modern church. Digging continued slowly until the earth began to show traces of water.

The sea was not far beneath their feet.

Then the two archaeologists uncovered an altar which suggested still another church lay below, this one almost certainly Byzantine. Later they came upon a number of exquisite frescoes in beautifully preserved coloring. (After restoration, some of these, too, will find a place in the church above.) But now the water was seeping into the excavation and starting to rise, so digging at the Byzantine level had to stop long before their curiosity was satisfied.

"Either Tyre has subsided or the sea level of the Mediterranean has risen since Byzantine times," Patricia explains. The team brought pumps in to enable them to



When their excavations and repairs were finished, Patricia and Pierre thought the church would be a lovely place to be married ...

continue their work for a while, and although these were strong enough to hold the water level steady they were never enough to drain the lowest church completely. When antiquity department engineers said they couldn't justify the cost of installing permanent pumping equipment at the site, the archaeologists decided reluctantly that they would have to fill the Byzantine excavations with sand to strengthen the foundations of the two upper churches. On the last day of digging Pierre, Patricia and a group of workmen stood knee-deep in water groping in the sediment. Out came handful after handful of Roman mosaic, fistfuls of little colored tiles. Then the lower level was abandoned and filled.

The seepage from the sea continued slowly for a while, however, stopping only after it had reached the lowest sections of the Crusader church. A new, elevated concrete floor was then poured at the modern level, leaving the damp Crusader level as an excavated cellar. There, water covers some stones, still and deceptively clear in the half light of electric bulbs strung down from the church above. In other parts, away from the thick stones which the Crusaders knelt upon, the sand is squelchy. Before visitors to St. Thomas' will be able to explore these sections there are problems of light and air to be solved. Then the Department of Antiquities will build a stairway down from the back of the present church sanctuary.

Above, at the modern ground level, Patricia and Pierre then proceeded with their original task, the restoration of the 18th-century church. Slowly its original grace and beauty began to re-emerge. Today St. Thomas' soars up in a scallop of arches, and the slender stone columns emphasize the lofty dimensions of what is actually a quite small building. The first and most lasting impression is the natural light, the combined effect of pale stone and numbers of glassless windows. Each blond stone is streaked with soft yellows, gingers and creams, yet each is solid, rough-textured, individual. High in the barrel-vaulted roof the tiny, barred windows let the bright Mediterranean sun pour in.

Once their restoration work was nearly—but not quite—finished, Patricia and Pierre decided that for them surely there was only one possible place to be married, the 18th-century church of St. Thomas, which sits above the Byzantine church they had uncovered and then filled, and which has a Crusader church in its basement.

Three days before the ceremony, a team of workmen was still carefully re-laying the stones of the 1760 St. Thomas' atop the new concrete floor, heavy marble diamond shapes fitted unnervingly slowly into each other and crisscrossed with contrasting black lines. On June 25, the day of the wedding, masses of flowers and branches were strewn around the outside of the church to hide the loads of earth and rubble piled up where an arched colonnade has yet to be restored.

But the wedding came off on schedule in

. . . so they were, in a Greek Catholic ceremony last June, with friends from a nearby "dig," Patricia's parents from America and Pierre's from Lebanon present in the church the couple had helped restore.

the brand-new church which had taken centuries to build. A stranger among the assembled family and friends watching the impressive Greek Catholic ceremony that day could not have guessed what lay beneath his feet, and that the young handsome couple at the wedding in Tyre had so recently helped to strip this lovely church to its bones, and put it back together again.

Today Pierre is back at his major task, helping to reconstruct the Roman city, and Patricia, now Mrs. Bikai, is planning a series of soundings in Tyre to try to discover the legendary Temple of Melkart, which is said to have been built to honor the ancient Phoenician city's god by Biblical King Hiram, who is known to have supplied Cedars of Lebanon to his friend King Solomon. If the temple does exist, Patricia thinks, some of its massive stonework may lie undiscovered beneath the Roman city her husband is helping to restore. The two young archaeologists may be arguing about where to dig for many happy years ahead.

Diane Willman, an Australian radio journalist based in Beirut, has covered the Arab world for the Canadian Broadcasting Corporation since 1969.

A GREENING IN THE ARAB EAST

BY JOSEPH FITCHETT

International troubleshooters backed by Arab scientists spur Middle Eastern agriculture toward abundance and profit.

PHOTOGRAPHED BY NIK WHEELER

Dr. Lawrence Curtis, a white-haired man in khaki work clothes, has the accent of a farmer, but the vocabulary of a professor. He points at a low, gray-green plant growing out of a plot of dry, Middle East farmland. The plant is covered with a dull wax coating, almost a fuzz, and among its leaves hang hundreds of small spherical gourds resembling yellow baseballs.

"It's a buffalo gourd," he says, "and if it works out in the desert the way we hope it will, it could double, even triple, the Middle East's protein supply. Gourds, in fact, could be as important to the future of agriculture as the soybean and the potato.

"You see, inside the rind of the buffalo gourd there's a cluster of small, flat seeds that are nearly 35 percent protein—more even than soybeans. Crush them and you not only get a quality oil for human use, but the leftover pulp is an excellent cattle feed. So far we've gotten a ton of seed per acre and if this plant yields like that in the desert you could plant it throughout the Middle East. A lot of this land is barren, but the buffalo gourd will grow in barren land, and far better than familiar protein sources such as peanuts and sunflowers, so ..."

He shrugs eloquently and, delving into the wire wastebasket he carries as a briefcase, produces a small white plastic bottle and shakes out a palmful of glistening, crisp, white seeds rather like finely shaped rice. "Here, try some of these," he says. "These seeds come from a close relation to that gourd: try a few; they're fried with salt, that's all. How d'you all like 'em?"

There are hesitant takers, then eager second helpings as Curtis continues. "The American Indians used to eat the seeds of the buffalo gourd, which grows wild in the Arizona deserts. But in the United States the soybean already gives us more vegetable oil than the country can consume, so nobody's going to bother developing a plant like this. Out here, however, it could be part of the answer to the problem. It's got a root as thick as a weightlifter's biceps—I excavated one 15 feet deep!—so it can get down to the water. It could be part of the answer, all right."

The problem to which the gourd may be one part of the answer is a crucial one: how to produce enough food—and the right food—in a finite world where population demands are overtaking existing resources.

Surprisingly, the problem is new in the Middle East. Although 90 percent of the area is semiarid or desert, the fertile 10 percent includes some real agricultural surprises. In coastal areas where there is adequate rainfall, in the historic river valleys of the Nile, Tigris-Euphrates and Indus, and in countless tiny oases, cultivation is sometimes as modern and intensive as anywhere in the world. In fact, taken as a whole, North Africa and the Middle East produce almost as much wheat as the United States.

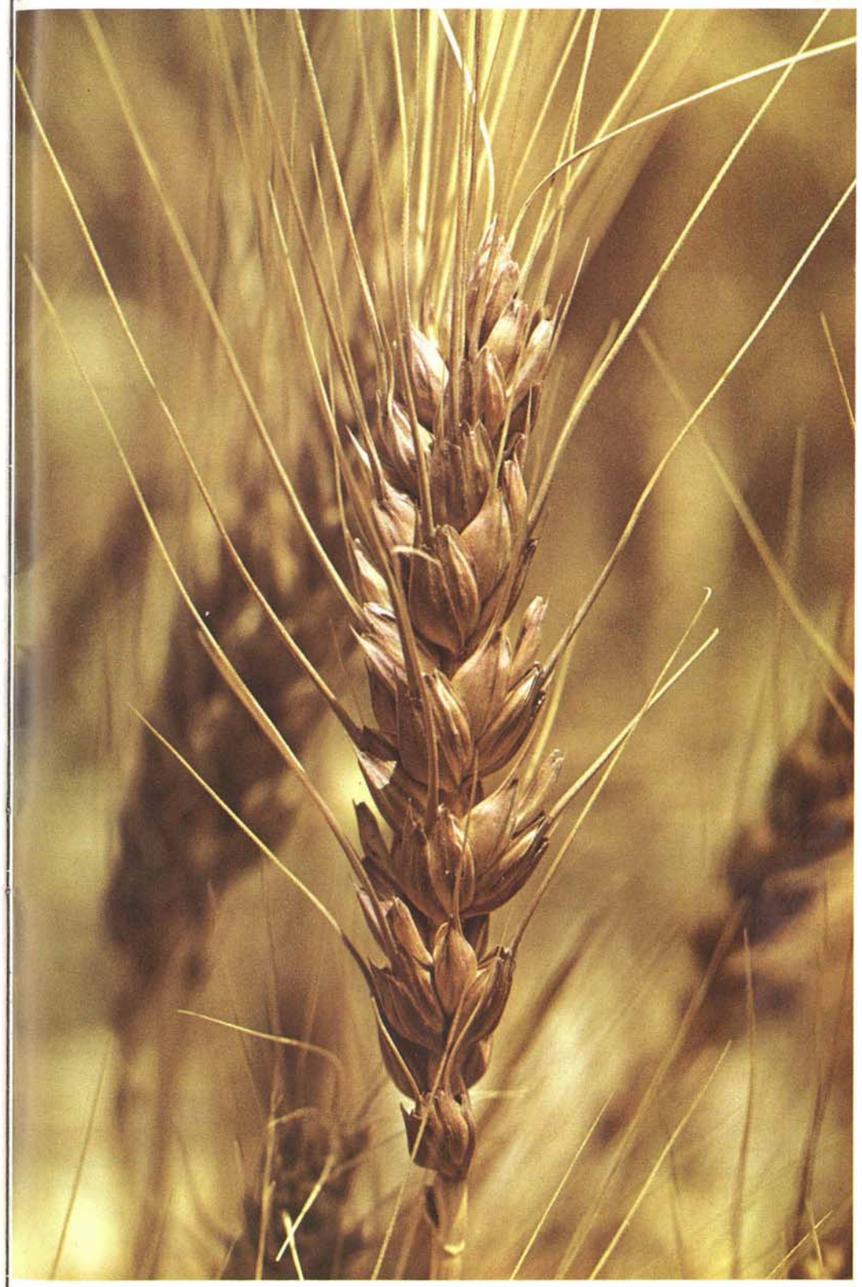
But in the future, according to Dr. Curtis and another 11 agricultural scientists on the Arid Lands Agricultural Development Program (ALAD), much of the other 90 percent of the land will also have to be used. That's why America's Ford Foundation, in cooperation with Arab countries from Algeria to Saudi Arabia, as well as Turkey and Iran, set up ALAD, an agricultural task force spearheaded by an international team of experts backed up by qualified local scientists. By introducing new crops, raising yields on current crops, improving techniques of sheep-raising and modernizing land preparation, this task force, in cooperation with the new generation of Arab technicians and scientists, hopes to spark an agricultural revolution within a decade.

"We *have* to do it in a decade," says ALAD's first director, Hugh Walker. "The problem won't wait any longer."

A Texas banker who took a special interest in helping farmers, Walker is generally acknowledged to be the father of ALAD. By combining unbanker-like optimism with unfarmer-like persuasiveness, he convinced the Ford Foundation that, with a well-knit package of modern agricultural technology, historically arid lands could be made productive. He led a team of experts to the Middle East where, with the Lebanese Government's Agricultural Research Institute, three experimental stations were founded.

Despite ALAD's fabulous potential payoff and occasional penchant for glamorous-sounding gadgetry, the program operates on less than $1 million a year—partly because participating governments provide technicians and facilities on their research stations (Saudi Arabia, in fact, meets the entire cost of its share of ALAD) and partly because the foundation's scientists are dedicated men. For the most part they downplay theoretical research (such as that being done on the buffalo gourd), prefering to talk about their work on such basic food crops as wheat, barley, maize, sorghum and millets. They frequently have an almost philosophical commitment to the redeeming value of agricultural work in an over-urbanized, hungry world and regularly spend 12 hours a day, six or seven days a week, in the fields working with local farmers and technicians. They believe ALAD's crash program can produce dramatic enough results to convince even the most cautious finance minister that agriculture can become a driving force in the development of the Middle East. Then the rest—men, marketing, credit—will follow.

Agriculture is already a major sector in most Arab countries. Overall, it accounts for one-fifth of the region's gross national product; nearly two-thirds of the population



work in agriculture; farm products make up a large part of total exports—particularly if oil is excluded. Farming is, and will remain for a long time, the way of life of most Arabs.

Traditional answers to extending agriculture, such as increasing irrigation, are expensive and can even in some cases do more harm than good. For example, in some areas farmers have been so thoroughly wedded to old techniques that when irrigation came, they failed to drain off the extra water properly. As a result rapid evaporation left their fields covered with mineral salts that ruined the soil. Some farmers try to expand cultivated areas by planting marginal dry land in wheat: with luck, they get a harvest or two. Then comes a drought and—as the United States tragically learned in the 1930's "dust bowl" catastrophe—the plowed land, left with only a scant cover of vegetation, is swept away by the wind.

Problems like these have slowed the takeoff of agriculture. In many places crop yields per acre are still low—which, in a self-perpetuating vicious circle, discourages the investment and modernization necessary to improve the yield. As a result the Arab countries, which until the early 1950's were self-sufficient in basic food crops, must today import food. And if levels of consumption continue to rise they will have to double their wheat and barley production by 1985 to keep supply in line with demand.

ALAD has several approaches in mind. Better water management is one; the buffalo gourd may be another. But above all, ALAD wants to improve farming technology.

In the five years since ALAD went to work in the Middle East results have been remarkable. In Lebanon, with only 20 percent of the country's fields planted in new miracle wheats, the harvest increased 125

Keith Henderson

Visitors inspect demonstration crop of Mexipak wheat at the Saudi Arab Government experimental farm in ad-Dirab, near Riyadh. Wheat was irrigated 10 times between late-November planting and late-April harvest.

S. M. Amin

Keith Henderson

Sections of the first season's experimental crop at ad-Dirab were covered by protective nets. The uniform height of Mexipak makes harvest by combine feasible.

Robert Azzi

Robert Azzi

Maize and millet are among basic food grains breeders are improving at the Tel Amara research station in Lebanon's Bekaa Valley.

percent in 1971. Elsewhere, wheat yields that once averaged less than half a ton an acre have soared in experimental fields to better than two tons per acre. With the improved wheat varieties and better farming management, average yields, throughout the region can be expected to go to a ton an acre—a rate only slightly below performance levels in pace-setting Mexico, scene of the 1960's first "green revolution."

And there is much more to come. In two years, hard "durum" wheats—a profitable Mediterranean specialty used by Italians for *pasta*—will match yields of bread wheat. Corn, another of the region's important crops, may achieve a dramatic 70-percent increase thanks to new "synthetic" varieties being developed with ALAD help. And millets and sorghum, which fed countless generations 2,000 years ago, are being revived especially grain sorghum—a hard, tiny red grain that grows in knobby clumps, lives on very little water and makes a high-protein unleavened bread.

Starting with his own personal collection of plants, ALAD's sorghum breeder has now scheduled more than 12,000 strains of sorghum for testing. If a suitable combination can be found, one that would give high yields in poor climates, sorghum could become an important world crop again. Forage sorghum, for instance—lush, dark-green elephant grass which grows as thick as a Kansas cornfield—has exciting prospects for fodder in semiarid grazing areas fringing the Fertile Crescent.

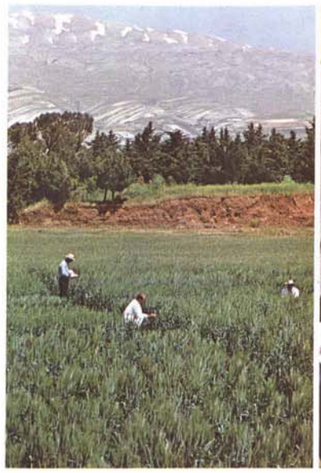
ALAD experiments have also shown that new technology can transform rice yield levels and production volumes. Seeds of an improved variety developed in the Philippines, planted in Iraq in 1968 and properly fertilized, boosted the value of the rice harvest to $30 million the first year. And if ALAD can convince farmers that they should plant clovers or other high-yielding fodder crops on land traditionally left fallow during the year it is not under wheat, the region could boost animal feed 10 percent.

Such gains, combined with research on water and soil management and the design of specially adapted machinery, should make it possible for the Middle East to grow food as efficiently as anywhere in the world.

It was the threat of imminent world famine that led to what we now call the green revolution, the undreamt-of breakthroughs in wheat production in Mexico and wheat and rice crops in Asia which have helped to solve the basic global food problem for at least the immediate future. At the same time, the emergency produced a new approach to agricultural development: the organization of well-financed, dedicated international teams which worked directly—sometimes for decades—with local specialists and farmers in the laboratories and fields, experimenting with ways to improve crops and modernize farming practices. Today, for example, ALAD cooperates with such organizations as the International Maize and Wheat Improvement Center (CIMMYT) in Mexico, the International Rice Research Institute (IRRI) in the Philippines and the Rockefeller Foundation in Turkey.

Plant breeding is a major area of research cooperation. ALAD's wheat breeder, Gerbrand Kingma, an American-educated, Mexican-trained Dutchman, draws on an international repertory of over 10,000 different known lines of wheat, selecting varieties which have the right characteristics for improving local wheat.

Although wheat originated in the Middle East, the region's modern varieties have been narrowed (by natural or rule-of-thumb selection) to a range of hardy but low-yielding plants. In the past, these qualities have seen Middle Eastern farmers through fat and lean years adequately. But the old-fashioned varieties cannot provide increased yields—basically, because if they are given more water and fertilizer, they convert much of it into more plant, rather than more grain.



At Tel Amara in Lebanon, ALAD experts search for the wheat most suited to the region. To cross two strains the breeder first cuts out the anthers on a budding plant (upper photo), then uncovers the pollen receptacles. On the mating plant the entire head is peeled and, once the sun's heat has made the yellow pollen emerge, swabbed inside a celophane envelope which is then dropped over the recipient bud, clipped and labled.

Since the key differences in high-yielding modern varieties—heavier grain, more tiers of grain, more grains per tier, less hull and more flesh on the grain, more heads of grain—are inherited by plants, exactly in the way children inherit their parents' eye and hair color, Kingma tries to cross local wheat's hardiness and flavor with modern wheats' high yields.

Crossing two wheats requires a delicate touch. Using nail scissors, the breeder cuts out the tiny anthers on a budding plant, so it cannot produce its own pollen. He then strips away the green outer casing and uncovers the pollen receptacles. On the mating plant, the entire head is peeled and snipped off, then jabbed in the ground by its stem so the sun's heat will make the pollen emerge. A moment is needed for the yellow pollen to appear, and the male "blossom" is then briskly swabbed around in a small glazed cellophane envelope. The pollen shakes off in tiny yellow puffs, coating the envelope (officially known as a pollinating bag), which is then dropped over the recipient bud and clipped tight with a serial tag. If that plant produces seed, it can only be the result of the cross between the two plants chosen by the breeder. Wheat breeders such as Dr. Kingma and his Lebanese colleagues at the Tel Amara research station in the Bekaa Valley have made many thousands of such crosses, searching for the right hybrids.

A breeder's job only begins with the actual cross, however. A hybrid wheat normally requires up to 10 years' time to stabilize as a new variety, which then consistently reproduces itself in a recognizable, standard form. Until then, each generation of plants, row after row—several miles long if put end to end—has to be scanned, the best plants selected, and *their* seed replanted. In the selection process, the breeder can spend only a few seconds spotting the most promising individual plants, in a kind of deadly serious beauty contest. For the breeding problem can never be reduced to a simple list of desirable characteristics: the weight of each grain, for instance, tends to diminish as the number of grains increases. The art is to strike the right balance for given circumstances.

To hasten the process ALAD experts fly hybrid varieties around the Middle East. In just one shipment last spring ALAD shipped out of Beirut 150,000 packets of seeds culled from 3,000 hybridized varieties. They went to 18 Arab countries at locations varying from 17 degrees latitude to 37 degrees latitude, from 500 feet below sea level to 1,500 feet above. Some were planted in arid soil, some in irrigated land. They were subjected to variations in temperature, to insects and to diseases. The idea was to determine which varieties stood up best to *all* conditions; modern breeders seek the best average so as to get the benefits of standardization.

Such testing—and it's also done on corn, sorghum, rice and clover—shortens the time required to produce new varieties by moving seeds from a spring harvest for replanting somewhere else for a second season in the same year. Such rapid exchanges of seed enable ALAD to identify the best-adapted varieties for Middle Eastern soil and climate: the various national nurseries feed back their findings to the central data pool, and sometimes immediately spin off their own breeding program aimed at solving a specific local problem.

Breeding is not a panacea: for instance, unless a farmer's land is properly leveled, seed, water and fertilizer will be unevenly distributed, depriving some plants and also preventing mechanical harvesting. Annual land-leveling alone has increased yields on some Iraqi farms by 20 percent. But breeding is the key to radical changes. With improved varieties, crop rotations can be quickened and harvests can be timed both to avoid late rains that rot crops before they can be harvested and to insure that the grain all ripens at the same time. Wheat that was grown in valuable irrigated land can be switched elsewhere and the land put into more sophisticated crops. Wheats with poor milling quality can be improved. Grain which shatters when harvested mechanically can be reinforced, and the flour's bad baking potential (requiring imported additives) can be corrected by breeding. Breeding has also produced a stiffer stalk and, at the same time, by crossing with dwarf Japanese wheat, a shorter stalk which is less likely

In a sea-level station (main photo), Dr. Kingma blows away golden chaff (left insert), while at a high-altitude farm (right), landowner Nadim Hourani points out still-green fields to Dr. Dean McCreary.

to buckle under the weight of the grain.

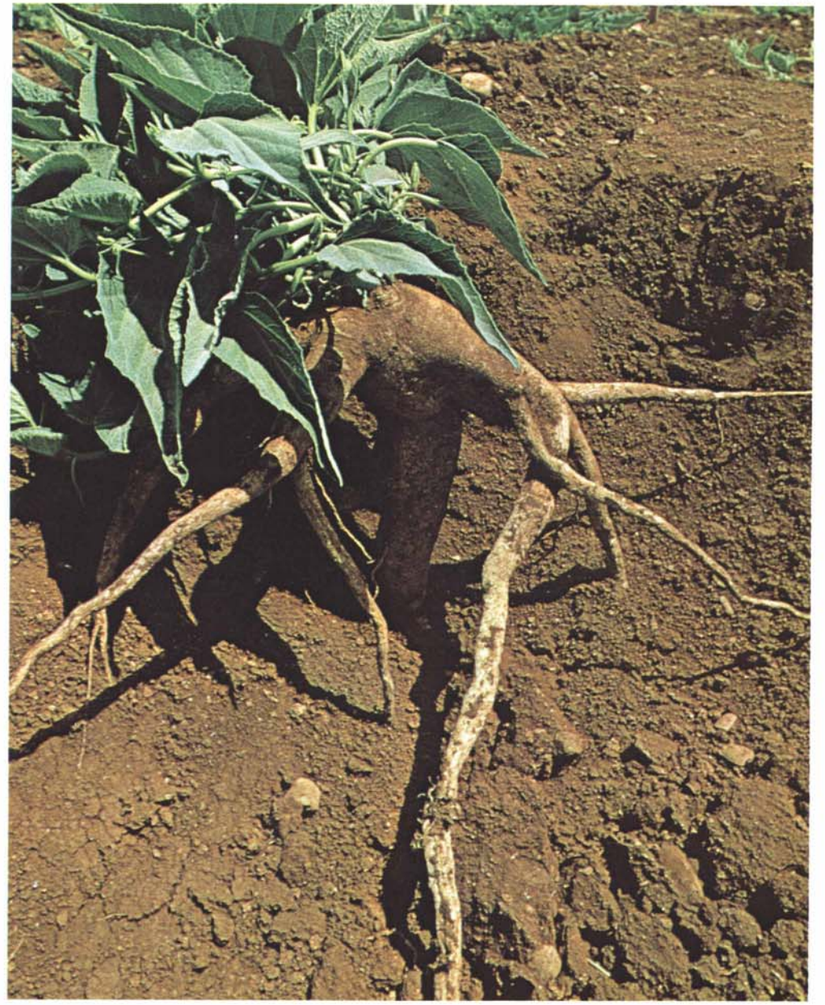
Plant breeding produces an important extra benefit too: more profit. And that in turn helps overcome the resistance to change which is a feature of a traditional agricultural society where a farmer is naturally reluctant to change any feature of a system which has insured survival for generations. But farmers who have seen their own harvests trebled are more willing to try new ways.

Breeding must be a continuous process because miracle wheats can bring problems practically on the same scale as their benefits. The conditions for bigger yields—more water, more fertilizer, thicker planting—also raise the risks of virulent disease. In the humid, densely planted fields of uniform varieties which modern breeders want to see, disease can spread like wildfire, and for some wind-carried killers, such as stem rust, the only defense is the wheat itself. Some varieties of wheat are resistant to rust, and in a typical old-fashioned wheat field, at least some of the different varieties represented would be resistant; so outbreaks were contained naturally. In green-revolution agriculture, however, a rust epidemic could wipe out an area's wheat production in the space of a couple of years, because only one variety of wheat is used. Aware of this, ALAD operates special, isolated nurseries where thousands of wheat varieties are systematically infected with Middle East races of rusts. Varieties which do not succumb are then crossbred with highproducing but perhaps vulnerable varieties.

ALAD has also cooperated with governments and agencies to help set up special "trap nurseries" at strategic points throughout the area, each containing a broad cross-section of wheats. Outbreaks of infection in the trap nurseries act as an efficient early-warning system against diseases and insects, as they move on winds and weather.

Robert Azzi

An ALAD researcher staples the long tendrils of the buffalo gourd to the ground. The thick root reaches as deep as 15 feet for water.



Although in this way battles can be won to protect satisfactory wheat lines, the war unfortunately is never over. Stem rust, with its trillions of spores, constantly throws up mutations, some of which thrive on wheat previously immune to all known races of the parasitic mold. Tame rusts in the United States suddenly turned deadly in 1950, laying waste crops across vast areas of the country. As miracle wheats spread across Mexico a decade later, relatively weak local rusts also changed, attacking native wheats and improved varieties alike, and nearly annihilating both. Mexico's food supply—and farmers' confidence in the green revolution—was only saved because a second generation of improved wheats were ready to distribute to distraught farmers. The constant shifts in diseases like rust underscore the need for a permanent, aggressive breeding program like ALAD's.

ALAD also helps maintain a planetary germ-plasm bank in Mexico—a collection containing countless carefully catalogued seeds, representing thousands of varieties of wheat. Every few years, the collection is grown out and seed from the new harvest put back in the bank's phials. The germ-plasm bank keeps on tap for breeders a practically limitless reservoir of wheat characteristics, so that even if a terrible calamity ravaged the world's wheat fields to the last plant, it would be possible to replant. And out of the germ-plasm bank's thousands of varieties, one strain—perhaps one that otherwise would have been lost forever because of the worldwide popularity of certain "super-wheats"—might offer salvation in the form of immunity from the scourge.

ALAD concentrates on wheat because it is the Middle East's most important food crop and because in developing countries, subsistence farmers—who produce the food of over half the world's population and in some areas occupy up to 80 percent of the land—are destined to go on playing the major role in agriculture for many years to come. By concentrating on wheat rather than

secondary crops, ALAD reckons to offer a better diet, and the hope of some economic gain, to the people who need it most.

Other developments are not overlooked. ALAD is also trying to increase sheep production—sheep are the chief source of meat and an important source of milk in the Middle East—and provide better grazing. Their work with sheep is unconventional for the region, but has great promise. Since the local *awassi* sheep usually produce no more than one lamb a year, ALAD crossed a prolific Greek sheep with the *awassi* and has come up with a crossbred animal that produces many more twins and triplets. Simultaneously, ALAD is trying to teach Arab farmers to plant forage crops—like clover—to provide feed for more sheep.

Even more promising is crossing high-performance corn hybrids to get high-performing genes that can adjust to a wide range of growing conditions; after two generations they stabilize at a high level of yield and their seeds can be replanted season after season. In 1969, by crossing 10 hybrids, Dr. Curtis got one champion that has yielded seven tons of corn an acre—20 percent more than the normal yield. By 1973, this "synthetic" variety could be in hundreds of fields in Iran and Lebanon.

Even with wheat, the biggest step remains to be taken: find a way to improve yields in the vast, unirrigated, but rainfed areas where the Middle East's poorest farmers work and from which more and more of the area's wheat will have to come as increased demand for luxury crops pushes wheat out of irrigated areas. Dr. Kingma is trying to decode the mysterious combination of traits that allows certain weedy-looking Middle East wheats to give *some* grain, even in very bad years. If he could then combine these survival qualities with high yield potential it is conceivable that the Middle East could again become one of the world's major graineries.

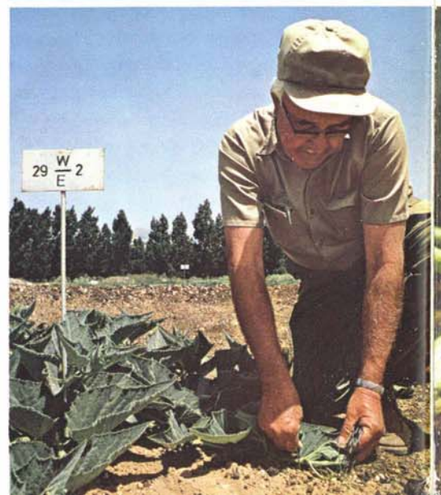
Last, but with enormous potential, there is the possibility of finding a crop that can grow in the vast tract of Middle East deserts—perhaps a crop like the buffalo gourd.

It is, Dr. Curtis warns, still a long way off, but progress is being made. Dr. Curtis has already started to propagate the best individual plants. He staples down the long tendrils and waters them so that a fresh root starts, which he then cuts away as a new plant. This cloning process produces new generations with geometric rapidity. Thus within two years, thousands of genetically-identical offspring could be ready to plant in dry areas. "Don't forget," Dr. Curtis explains, "every strawberry you ever ate, every variety of rose you ever saw, all started from one plant."

The latest surprise, a major breakthrough for the program, is that some of Dr. Curtis' star-performing gourds are male sterile—opening vistas of easy hybridization, with its promise of jumped-up yields, and easier propagation. (And since the gourd is a perennial, not an annual, the usual hybrid problem of buying fresh seed each year would not arise.) In the meantime, Dr. Curtis goes on crossing plants to obtain higher yields of seed, higher oil and protein content, quicker-maturing plants and a purer quality of oil which can be stored without turning rancid.

Winning acceptance for the buffalo gourd is another area of research. In Louis XIV's France, an enterprising minister of agriculture like Parmentier needed only to persuade the King to wear a potato flower one day on his resplendent court dress, for land-owning courtiers to rush out and plant potatoes. For Dr. Curtis and his colleagues an equally appropriate solution will take longer—even in an age in which agriculture seems to be entering the realms of science fiction and in which solutions to problems are limited only by the extent of men's resourcefulness and determination to succeed.

Joseph Fitchett, a West Virginian educated at Princeton, currently covers the Arab countries for the Westinghouse Broadcasting network.



Dr. Curtis (left) hopes the seeds of the buffalo gourd (above) may someday become a vital source of protein-rich oil in desert lands.