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ARAMCO WORLD
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MARCH–APRIL 1981

Formula One

ARABIC AND
THE ART OF PRINTING
—A SPECIAL SECTION

◀ The astonishing camel – shown here being carefully loaded with merchandise – can carry a 1000 pound load for a short haul – or 600 pounds almost forever.

ARAMCO WORLD magazine

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By John Lawton

Across the finish line it came — the sleek white racing car that put Saudi Arabia, and Great Britain, into the forefront of international Grand Prix racing with six national prizes and two world championships.

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For more than a century, the Islamic world, from Malaysia to Morocco, has been producing thousands of postage stamps depicting the beauty of the mosque and the minaret — the site and symbol of Muslim worship.

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In Cairo today, clowns, acrobats and aerialists — along with lions, elephants, tigers and bears — maintain a spectacular tradition that goes back, some say, to Ptolemy II, 2,000 years ago.

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The Nabateans built a magnificent rock city in the midst of nowhere and a thriving, mercantile civilization that became the envy of Rome.

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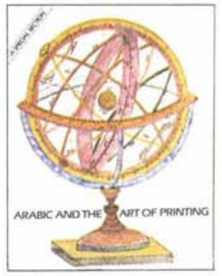
By Daniel da Cruz

The camel outworked the elephant, out-plowed the mule, outdistanced the ox and even managed to scare some Indians. With its Bedouin masters, the camel also mastered the desert and changed history forever.



ARABIC AND THE ART OF PRINTING – A SPECIAL SECTION

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Cover: Racing towards victory, Alan Jones drives the swift white Saudi-Williams FW07, a racing car sponsored by a consortium of nine Saudi Arab companies – in the year-long series of 14 Formula One races, the prestigious International Grand Prix events that decide the World Championship in auto racing. Jones, in an unexpected victory, won the 1980 World Driving Championship, while the car took first place in the Constructors' Championship and six of the season's Grand Prix races. Painting by Michael Turner (© 1980). Back Cover: One of the featured acts of Egypt's National Circus. Photo by John Feeney.

A "blistering triumph" for the "back-street boys"

Formula One

WRITTEN BY JOHN LAWTON PHOTOGRAPHED BY MICHAEL TURNER

Formula One

As the fastest cars in the world hurtled over the finish line in the finale of the 1980 Grand Prix racing season, two flags unfurled in the pits. One was the Union Jack, the other the national colors of Saudi Arabia.

There was every cause to wave both, for, as one sports writer put it, the British and Saudi Arab "back-street boys" of auto racing had, with cars built in an upretentious little factory in southern England, beaten the giants of the Formula One world: the builders, sponsors and drivers of the international Grand Prix cars that compete annually in national races for the world's auto racing championships.

The victory, according to the *Observer*, a British weekly newspaper, was a "blistering triumph" for the infant Saudia-Williams FW 07, a model that – in just its second year on the track – won first place in six of the season's 14 Grand Prix races, first and third places in the World Championship for drivers, first place in the Constructor's Championship, with more points than had ever been scored before, the Eutectic-Castolin trophy for car reliability and the six fastest laps of the season.

It was also an exciting conclusion to a story that began in 1977 when independent car constructor Frank Williams, reeling from years of struggle to keep his cars on the track alongside such world famous names as Ferrari and Lotus, decided to have one more try "to prove that my cars could beat theirs."

At first, Williams would probably agree, his chances were slim as, with only four employees, plus designer Patrick Head, he leased part of a factory in Oxfordshire – that they had to paint themselves – and set about building a car. But then Williams, a perky, 38-year-old Briton, persuaded the advertising manager of Saudia, the national airline of Saudi Arabia, to sponsor his car. Saudia did not put up an excessive sum in Grand Prix terms, but it was enough to keep going. And for Saudia, it was a bold move; until then airlines had shied away from racing sponsorships because of the potential connection between flying and accidents.

Now it was Williams' turn to be daring. He ordered one of his cars resprayed white and had the name of one of Saudi Arabia's largest trading companies, Albilad, painted round the cockpit. The car was loaded onto a trailer, towed by Williams into London and parked outside the Dorchester Hotel, where an Albilad investor was staying. When the investor saw it he agreed to join Saudia as a sponsor and to encourage other Saudi companies to follow suit.

Eventually, a consortium of Saudi Arab firms was formed. The four major partners were Saudia, Albilad, Technique d'avant Garde (TAG), and Dallah-Avco. Later, five smaller Saudi Arab firms, M and M, Baroum, Bin Ladin, Kanoo and Encotrade, joined too, with additional support from an oil company, a tire company, a sparkplug manufacturer and British Leyland, a British auto maker.

In a two year period, this consortium put up close to $4.5 million, a sum, automotive industry sources say, that was only a fourth the budget available to the Formula One giants, but a blessing to the Williams team. "You've got to hand it to the Saudis," said one Williams aide. "We went to them with an unproven car and they gave us a chance."

The Saudia-Williams design team quickly took advantage of the opportunity. Openly inspired by the Lotus 79 racer, the "first real wing-car," Williams and designer Head decided to avoid further innovation; their car had a classic monocoque and honeycomb chassis and an almost classic rocker arm front suspension. "But from that basis," said Williams, "we worked to improve its most important qualities: aerodynamics, weight distribution and suspension. We're not innovators. We prefer to develop a car step by step."

What they came up with was a model that was simple, light and maneuverable. Also, perhaps even more importantly, it was reliable. In a total of 28 race starts, the two Saudia-Williams cars had to pull out only four times – twice with broken drive shafts, once with crown wheel and pinion failure, and once due to an engine oil leak.

"My car," says driver Alan Jones, "was consistently competitive all year. We had the Renaults to contend with at the beginning of the year, the Ligiers in the middle, and Brabhams at the end. But we were in the top six in every race."

One reason for this was the Saudia-Williams insistence on perfection – right up to the last race of the season, the U.S. East Grand Prix, by which time the World Championship was already theirs. The team, for example, flew to America with four cars and four engines for their two drivers and at the close of practice changed both engines. "After 250 miles they've lost their edge," says Williams. "We only use the best. That's why we're winners."

By the "best," Williams not only means the best parts but also the best people, as those who follow the glittering but grueling world of Formula One racing make clear in their assessment of the Saudia-Williams squad. For example, each of the four Saudia-Williams cars – three racers and an experimental model – has two mechanics each, all with a reputation for diligence.

As for the rest of the squad observers say that designer Patrick Head is a "practical engineer" with a college degree who hides his will to win under an overdose of English "cool." Driver Alan Jones, who at the age of eight watched his father win the Australian Grand Prix, is "ready to give all he has."

Frank Williams himself, observers say, is a "resolute man." A non-smoker and non-drinker, he keeps in trim by running four or five times a week, and on race weekends completes two laps of the average Grand Prix circuit – on foot. On his frequent visits to Saudi Arabia, Williams even runs at one o'clock in the morning when the temperature is cool.

Williams, Head and the mechanics, of course, spend most of their time in the Oxfordshire factory, now divided into three units. The first is where the cars are built, the second where the cars are maintained and the third where the research and development is housed.

It was from these workshops in the quiet English countryside that a development of the Saudia-Williams FW 07 emerged in 1979 – too late to take any honors that season, but showing the form that would sweep the Formula One board in 1980. No major changes were made, but in search for more speed, they did give the car a new underside profile midway through the season.

Towards the end of the season they also fitted one of their cars with a semi-lock differential, intended to improve handling on sharp corners, but eventually they left this car in the garage and stuck to the cars they knew were good. "We don't like to take risks," explained Williams.

The team had every reason to be cautious, for by September the rugged Australian Alan Jones in his Saudia-Williams, and the slight Brazilian Nelson Piquet in a Brabham BT 49, were

locked in a man-to-man duel for the drivers' World Championship.

Jones had made a promising start in the season, winning in Argentina and placing third in Brazil. But then he hit a lean patch, being forced to retire in South Africa and the United States Grand Prix (West). He came storming back in Belgium, with the appearance of the "B" version of the FW 07 – which placed second – and then won the French and British Grand Prix. Meanwhile Jones' teammate, Carlos Reutemann, robbed Piquet of valuable points with a win on the Monaco circuit, third place in Germany and second in Austria, apparently clinching the championships for Jones. But then a bad mistake in Holland, where Jones ran off the track and damaged his skirts, threw the championships wide open again and the pressure rose again.

Both drivers, of course, had their fans, but those for Jones were particularly avid. When he received a new engine in Imola, Italy – flown in on a delayed British Airways flight for the third to last race of the season – he found that the factory personnel had attached a label to the engine. It read: "You'd better win, or else..."

As it turned out, Jones did not win that particular race. Because of brake trouble, he came in half a minute behind Piquet, a loss that gave Piquet a one point lead in the World Championship for drivers. Fortunately, a determined performance by teammate Carlos Reutemann of Argentina – who came all the way through the field with no fourth gear and a broken exhaust to take third place – gave Saudia-Williams enough points to clinch the Constructor's Championship.

This, however, diminished in no way the team's efforts to give Jones the best possible chance of catching up with Piquet at the second to last race of the season at Montreal. Before flying off to Canada they squeezed in a day's testing of the new differential in an attempt to give Jones the edge, and by the time Jones and Piquet took their places on the starting grid at Montreal, the tension was electric. Then the lights turned green and eight cars instantly collided in a chaotic shunt. Jones, who made the best start, appeared to bump Piquet, who went into a spin. Then Jones' rear body cover flew off and suddenly cars were going in every direction, with a whole clutch of them colliding on the left hand side of the track.

The re-start was less chaotic and Jones took the lead. In the second lap, however, Piquet took over and stayed in front until the 24th lap of the 70-lap race. But then the Brazilian's engine blew up, leaving Jones a clear track to the World Championship.

But if the Canadian race was not a conclusive win for Jones, the last race of the season in Watkins Glen, New York, certainly was.

As in Montreal, Jones got in trouble early: underbraking on the first corner, he ran wide on the grass and by the time he had nursed his racer back onto the track, he was in 12th place with Piquet in second place and Reutemann in third. But by lapping at a tremendous pace – and smashing the official lap record time after time – he fought to catch up and by the 25th lap of the 59-lap race, had reached fifth place. Meanwhile, Piquet, hard pressed by Reutemann, had skidded off the track and smashed his car's skirt system beyond repair.

At the halfway mark, Jones had picked up 10 places and won an open track to the leading Alfa-Romeo as, further down the track, car after car was falling victim to the grueling Watkins Glen circuit. Pushing the Saudia-Williams to its limit, Jones grimly kept going and – when the leading Alfa-Romeo's engine died – hammered across the finish line to score a victory that fully endorsed his world crown and the Saudia-Williams Constructor's title.

And there was more to come. Seconds later – further proof that the Saudia-Williams model really was the car of the year – Reutemann streaked home in second place, a one-two win described by Peter Windsor, British Sports writer of the year, as a "walkover mechanical victory" for the "ultra-reliable" Saudia-Williams car.

The final points tally for the year told the story briefly: Jones, 67 points, Piquet 54 and Reutemann 42 in the driver's championship, and the Saudia-Williams car an amazing 120 points – more than double that of its nearest rival for the Constructors' Cup.

It was a stunning triumph for the whole Saudia-Williams team, as well as for the drivers, for in modern motor racing the people who build, run, develop and sponsor the car win too. Even as Jones and Reutemann hurtled over the finish at Watkins Glen, for example, Patrick Head was already back in England, working on a new car for the 1981 season and his haste was not wasted; by February 7, 1981, when Reutemann took first place in the South African Grand Prix, the Saudia-Williams team was again a contender for the World Championship.

John Lawton is a correspondent for Aramco World Magazine.

MOSQUES, MINARETS AND STAMPS

WRITTEN BY ROBERT OBOJSKI STAMPS FROM THE AUTHOR'S COLLECTION

As a public place of worship for Muslims, the mosque has a special importance – one reason why governments in the Middle East, North Africa and the Far East have chosen to depict mosques on their postage stamps. Another is that these places of worship are often historically valuable, architecturally striking and esthetically beautiful.

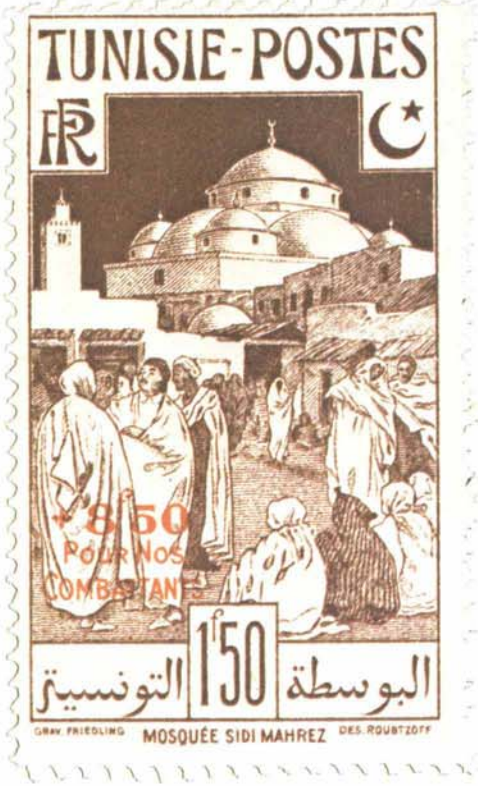
From Malaysia to Morocco, the typical mosque has the same basic form. Exteriors are often rectangular in outline with interiors consisting of a central, open court surrounded by a cloister or walkway covered by a roof atop rows of pillars. A dome often covers the mosque's central court. The wall facing the Ka'ba in Mecca, the holy city of Islam in Saudi Arabia, contains a prayer niche, or *mihrab,* towards which worshipers face when they pray. Rising above most mosques – vertical extensions of them – are one or more minarets from which muezzins call the faithful to prayer five times a day.

Most mosques have three features in common: fountains or faucets used by Muslims to wash before prayer, space for worshipers to pray and a pulpit, or *minbar,* from which a learned member of the Muslim community gives the Friday sermon. But there are variations on the basic design, and the numerous postage stamps issued by Muslim countries throughout the world show graphically how extensive these variations can be.

In Turkey, for example, mosques and minarets are frequent themes on postage stamps, particularly the Hagia Sophia and the Blue Mosque, two of the most famous buildings in the world.

The Hagia Sophia mosque is in Istanbul. Built as a Christian church by the Byzantine Emperor Justinian in the sixth century, it was converted into a mosque by the Ottoman Turks, who captured Constantinople from the Greeks in 1453. It is depicted on a 1955 Turkish 30 *kurush* stamp.

A 20 *kurush* value in the same set depicts another of Istanbul's famous structures, the Mosque of Sultan Ahmad, better known as the "Blue Mosque." The Ottoman Sultan Ahmad I built the Blue Mosque between 1609 and 1616, and it is the most conspicuous edifice in Istanbul that can be seen from the Sea of Marmora. These two stamps – the one showing Hagia Sophia and the other showing the Blue Mosque – are part of a series issued to publicize the Tenth International Congress of Byzantine Research, an event which took place in Istanbul in September, 1955.



Cairo, one of the most picturesque of Middle Eastern cities, contains more than 400 mosques, and numerous Egyptian stamps picture Cairo's mosques and their minarets. The best known mosque in Cairo is al-Azhar – also the name of the world's oldest university. Built in 972, al-Azhar has grown in size and grandeur over the centuries, and on the occasion of its 1,000-year anniversary, in 1957, the Egyptian government issued three stamps clearly depicting the mosque's towering minarets. Other Egyptian stamps, including a series of airmail issues from 1959 to 1965, have also featured al-Azhar.

Another famous mosque in Cairo is the Mosque of Sultan Hasan ibn Nasir. Built between 1357 and 1360, this structure has long been a Cairo landmark. Islamic art in Egypt reached its peak with the construction of this great shrine to the Muslim faith. This mosque appears on a number of Egyptian stamps, including six values in a regular issue series from 1953 to 1956. In the early 1970's the Egyptian government printed special, multicolored four-stamp sets showing famous minarets within the city of Cairo. Included in a 1972 set, for example, are stamps depicting the east and west minarets of the Sultan Hasan mosque.

A number of Middle Eastern countries have collectively produced a myriad of stamps illustrating the famous Dome of the Rock in Jerusalem. Erected by 'Abd al-Malik ibn Marwan in the seventh century to commemorate the Prophet Muhammad's journey to heaven, the Dome of the Rock is one of the great Islamic shrines and one of the first great works of Islamic architecture. Its unique, octagonal shape and golden-colored copper dome, as well as its beautiful tiles, set it apart as one of the loveliest religious monuments anywhere. Another famous mosque in Jerusalem is al-Aqsa. According to the Koran, God miraculously conveyed Muhammad to the site of this mosque on a night journey from Mecca.

Both the Dome of the Rock and the al-Aqsa mosques are depicted in a regular series issued by the Jordanian government in 1954.

Other Middle Eastern countries have also printed stamps showing the Dome of the Rock. Iraq, for example, has produced several varieties of stamps, in particular a five *fils* specimen issued in 1977, showing an overall view of the mosque that captures its unique architectural beauty. And after World War I, when the British mandate issued its own stamps for Palestine, several values in the long regular series from 1927 to 1945 depict the Dome of the Rock. Though these latter stamps are modestly priced, they still have great collector interest.

In Saudi Arabia, site of Islam's most important shrines, stamps naturally depict the Sacred Mosque in Mecca, the Ka'ba, and the Prophet's Mosque in Medina, another holy city.

Such stamps show graphically that details in shape, size and materials used for construction may vary greatly from one region to the next. Each country, in fact, has stamped distinctive characteristics onto its mosques and minarets.

The Grand Mosque of Tunis in Tunisia, for example, has a square minaret with galleries running along the sides of the mosque. From within ornate battlements on the minaret rises a smaller square tower crowned by a pyramid roof. Superb designs decorate the walls of the structure. The minaret of this mosque – built in 732 – looks quite different from the circular, slender towers of many Turkish mosques. In fact, if someone were unable to read the writing on a Turkish stamp, he might easily be able to recognize it *as* a Turkish stamp because of the shape of the minarets.

In parts of Africa, minaret designs diverge even more from those seen in the Middle East. In Somalia, for example, mosques often have windmill-like round minarets with two galleries. A mosque in Djibouti, so designed, adorns a Somalian postage stamp, and a stamp from the Ivory Coast shows the mosque of the inland city of Bobo-Dioulasso with a motif typical of the mud-brick architecture of the African village. Indeed, postage stamps – insofar as they depict houses of worship – convey the different architectural styles of the countries from which they originate.

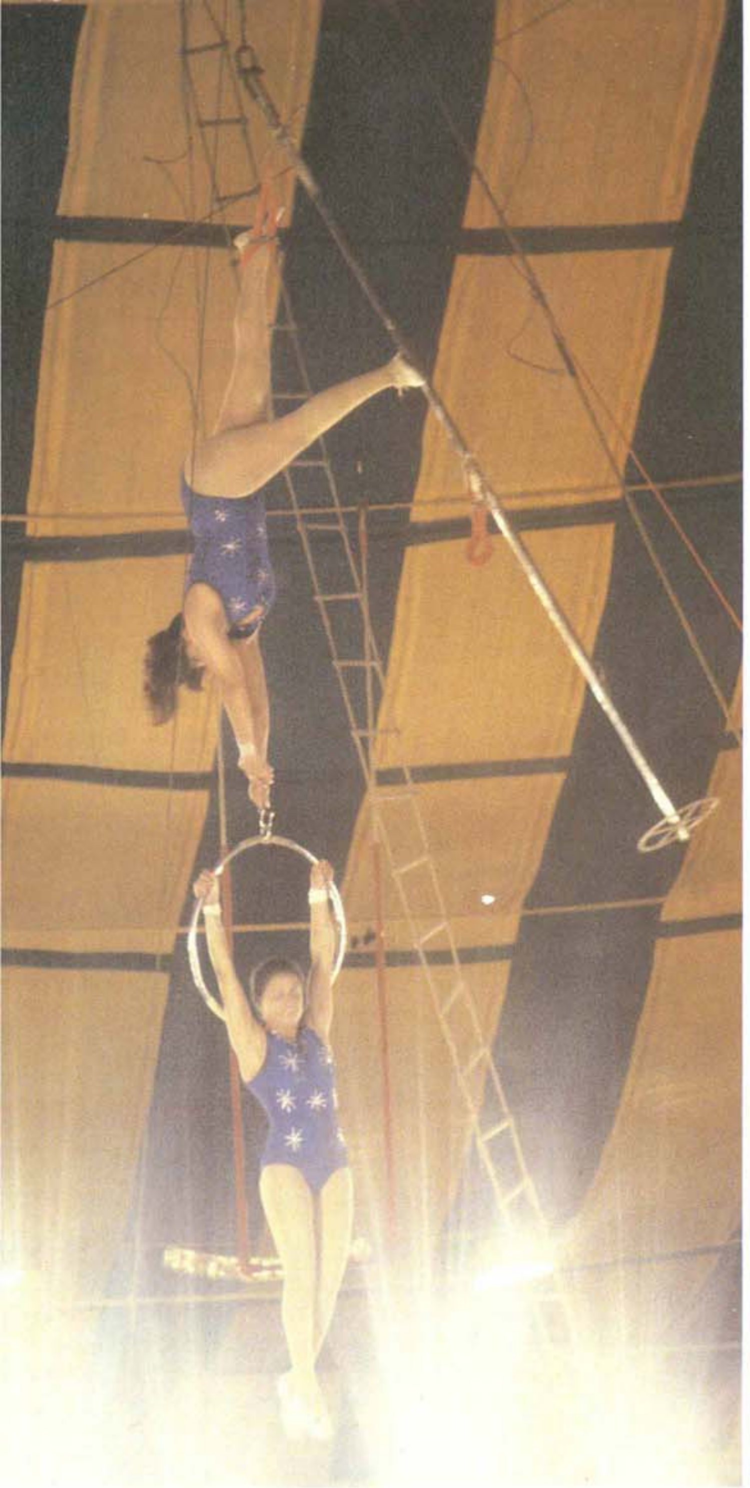
Even the most enterprising philatelist will find it a great challenge to put together a comprehensive assemblage of stamps depicting mosques and minarets. Over a period of more than a century, dozens of countries have collectively turned out thousands of postal issues in this category.

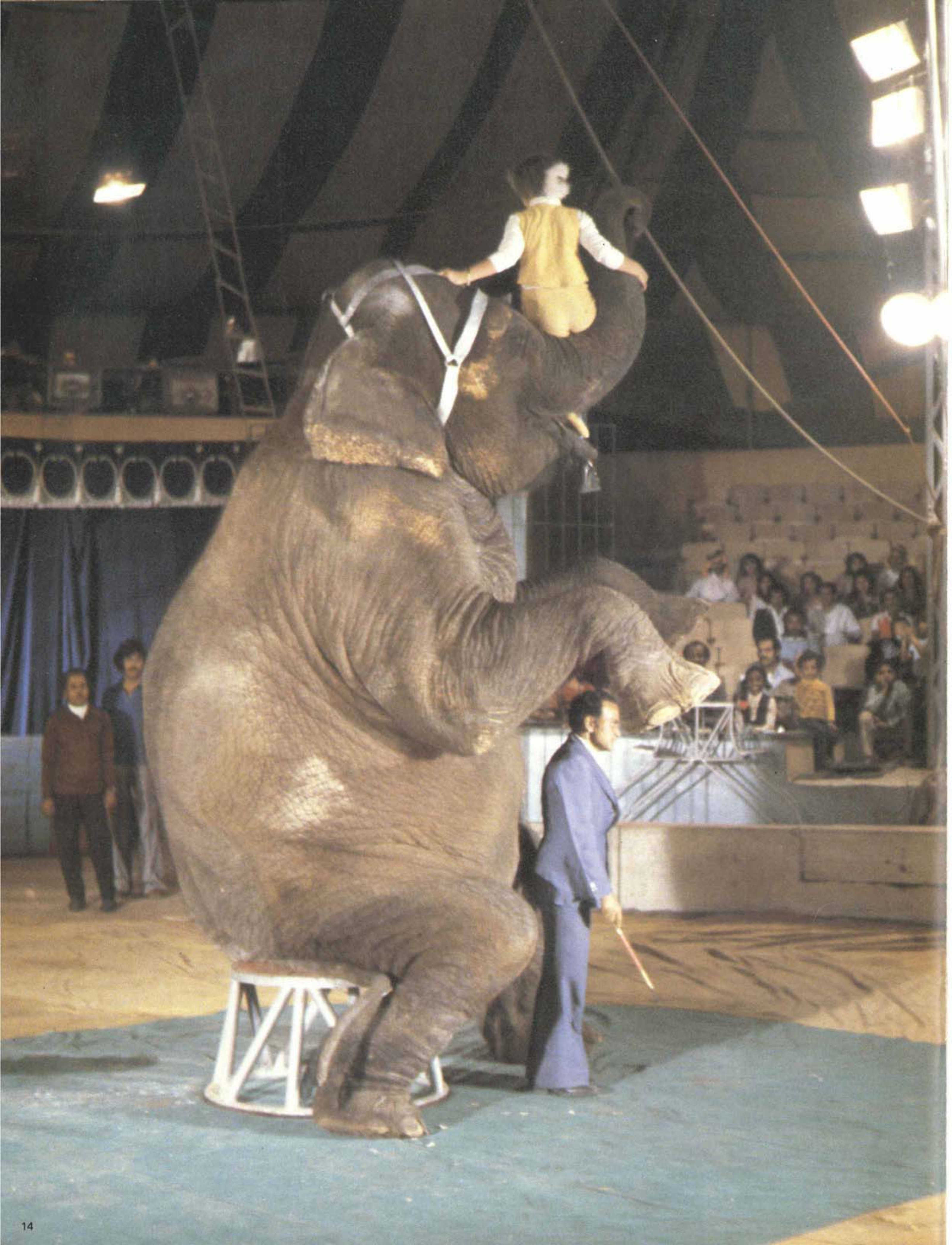
Robert Obojski, a specialist on Middle East stamps and coins, contributes regularly to Aramco World.

MAN AND BEAST... FEAR, WONDER & EXCITEMENT...

·UNDER THE BIG TOP ~ IN CAIRO·

WRITTEN AND PHOTOGRAPHED BY JOHN FEENEY





No matter where you are, circuses are the same: the shrill sound of a clown's whistle, the staccato crack of whips, the smells of the great beasts and the sawdust under the Big Top. They weave a spell over child and adult alike. But in Cairo the magic is slightly stronger – a reflection, I like to think, of the fact that the Egyptians were probably the people who, 2,000 years ago in Alexandria, created circuses in the first place.

One story is that Ptolemy II Philadelphus, king of Egypt from 285-246 B.C. – who made Alexandria a leading center of the arts and sciences in the Hellenistic world – gathered a large collection of animals, birds and reptiles from all over Africa and the Middle East and began to parade them before his subjects on festive occasions.

Today, of course, the circus in Cairo is quite different. The Egyptian National Circus now is a three-ring extravaganza – with each ring under a separate tent. One tent is permanently beside the Nile, at Agouza, and the other two, during the summer months, are on tour to Alexandria, to cities along the Suez Canal and even abroad.

In some ways, the original format of the circus has changed remarkably little. The exotic animals are still there and so is Kawitschouk, Cairo's "Rubber Lady" – whose body contortions today are exactly those depicted on temple blocks carved at Thebes, today's Luxor, 3,000 years ago.

But there have been changes. In acrobatics, for example, the Egyptians today have an international reputation because of such performers as Farouk Rashid – who balances a 30-foot pole on his forehead, while his three sons, Ashraf, Alon and Zenab climb it and perform while balanced on their father's brow. Other stars include the "Helw" family, the most famous name in the Egyptian circus. The Helw family has been involved with the circus for more than 100 years, and though they include lion tamers as well as acrobats, their acrobatic feats are particularly well-known. Every night, for example, Hassan, a 10-year-old member of Muhammad Helw's acrobatic troupe, is catapulted 10 feet into the air and, after a series of spectacular midair somersaults, lands in a chair balanced on the end of a long pole.

Circus-goers, of course, see the clowns, the animal trainers and the acrobats – as well as the magnificent animals – only in costume and on display. What they don't see, behind the glitter, is the sweat of countless hours of practice, preparation and fine-tuned cooperation – the hallmarks of professionals either born to the circus or trained there.

Muhammad al-Ghohary, for example, has spent all of his 45 years working with lions, tigers, elephants, giraffes and bears, and when he lifts his shirt you can see deep scars stretching across his body. ("People think lions are the most ferocious circus animals," he says, "but bears are the worst.") And today his 12-year-old daughter, Reda, is following the same trail. One night "Batta," the circus elephant, stepped on her arm midway through their act and Reda had to either quit or continue with her arm broken. She continued and the next night went on with her arm in a cast.

Batta, sadly, is the last of three elephants that used to grace the big top in Cairo; the other two were killed in a fire, along with eight lions. As a result, she still shies nervously if she gets too close to bright lights. She's also afraid of mice and on tour to Alexandria gets nervous at the sound of Nile frogs. Nevertheless, she is still an elephant, the biggest and strongest land-based creature on earth, and that means that Muhammad and Reda must always be careful. It also means that they must provide Batta with vast quantities of food; her daily menu consists of 80 pounds of sugarcane, 20 pounds of green grass, 10 pounds of oats and 60 pounds of sweet potatoes.

Clowns, of course, are also an integral part of any circus and the Egyptian National Circus is no exception; the Agouza tent features four clowns and an act sure to draw squeals of delight and laughter from children.

The clowns are "Lu-lu" (pearl), "Sukkar" (sugar), "Fustuq" (pistachio) and "Mishmish" (apricot), and they open their act by ambling into the tent dressed as street musicians intent on "joining the circus." The Ringmaster orders the four to move on. "It is not permitted to stop here," he says. The clowns obligingly move a few steps to the other side of the ring, but the Ringmaster says: "It is forbidden to stop here also."

Consulting each other, the clowns agree "they can't stop anywhere," and decide to make a daring "jump" to the ground from the two-foot high ledge surrounding the circus ring. Holding hands for their great leap, the four clowns start counting – "one, two" – but on "three," instead of jumping, they calmly *step* down, in silence, and the crowd roars.

Mishmish, whose real name is Tamini Muhammad 'Ali, is another performer who has spent all his life in the circus – in his young days he was an acrobat – and his daughter, it turns out, is the circus' "Rubber Lady," whose contortions are the result of training and practice since childhood.

Outside, by the lions' cages each night, another troupe warms up as they await their cue. This is Muhammad Saad's "Aswan Seven." At last, the circus band strikes up their theme, the velvet curtains sweep back and the "Aswan Seven" leap into the brightly lit ring to put on a short, fast-paced performance that their leader, Muhammad Saad, says is based on a very old Egyptian circus routine "which owes nothing to anyone."

It sounds simple: three of the seven – called "shooters" – lie down on small, padded, curved stools, their feet in the air, and "shoot" the other four – "fliers" – back and forth in the air, rather like basketballs. But it is in fact a brilliant display of timing and agility, perfected by practice: six hours a day for five years.

One result of this, says Muhammad Saad, is that the "shooters" have hard calluses the size of hens' eggs on their

Far left, Kawitschouk — the circus' "Rubber Lady" — can literally tie herself in knots, exactly like depictions of humans carved at Thebes 3,000 years ago.

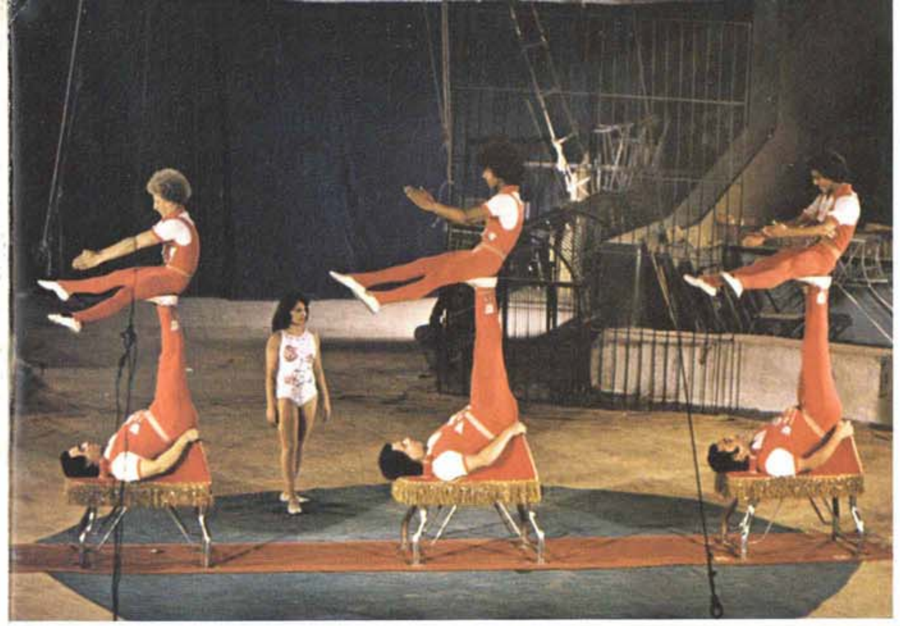
Left, the "Aswan Seven," who appeared with the Ringling Brothers circus in America last year.

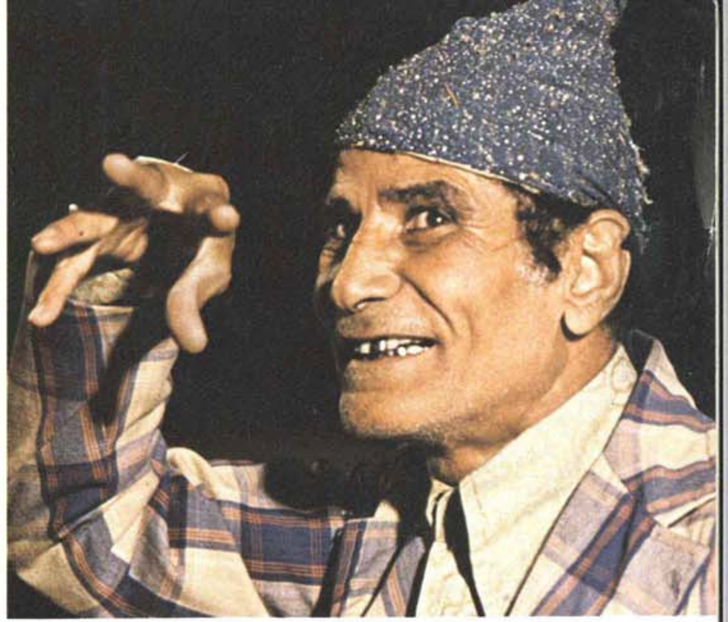
Right, "shooters" steady the "fliers" of the Aswan Seven.

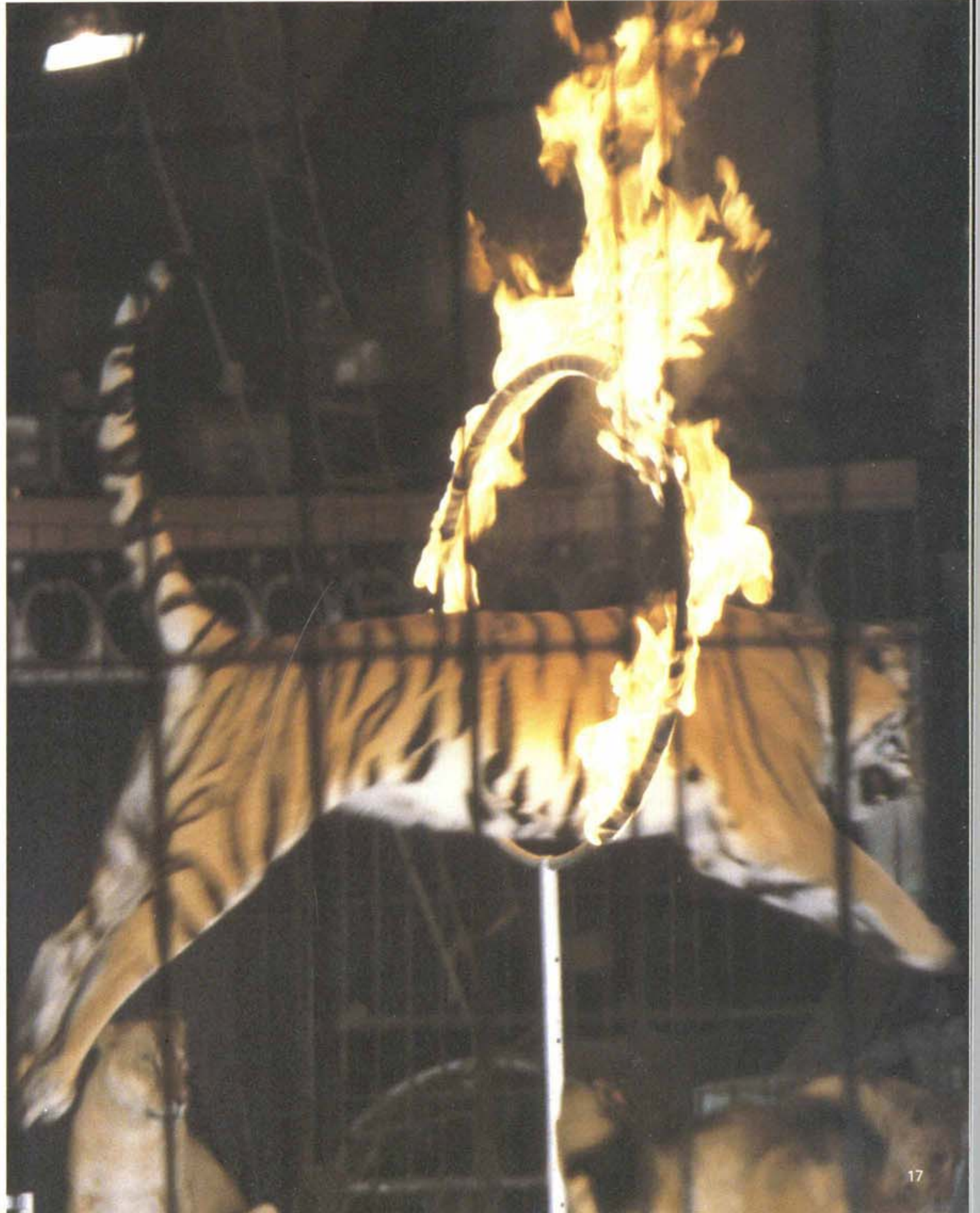
Far right, one of the four clowns dressed as street musicians who want to "join the circus."

Below right, the lone tiger in Ibrahim Helw's cat act.

Below, the other three "street musicians" ham it up before their big leap.







shoulders. "We shooters have these permanent calluses on our shoulders and backs at the point where they press against the padded stools as we 'shoot' our partners with our feet from one to the other."

The Aswan Seven have traveled with their famous act to Hungary, Romania, Sweden, Denmark, England and France, and with the Aeros Circus in East Germany. "During our German tour we discovered that Nadia, a lithe little 'flier' and the wife of Shaker Abbas, one of the team's three 'shooters,' had become pregnant. What were we to do? And in the middle of a tour?"

Nadia, herself, decided she would go on "flying" as long as she could. The German circus doctor pleaded with her to stop, but all he got in reply was: "You don't understand, doctor, we must teach the little one who is coming to be ready for us." At that point the Aswan Seven began calling themselves the "Aswan Eight" – though mystified German audiences could still count only seven performers.

In 1980, the Aswan Seven – or eight – appeared with the Ringling Brothers' circus in America. "Ringling's," says Muhammad Saad, "always searches the world for three acts-of-a-kind to appear simultaneously in their three-ring circus. But in our case they could not find one – let alone two – like ours, and so Ringling's told us that for the first time in its history we could go on alone."

Muhammad Saad of the Aswan Seven is a Helw, and so is Muhammad, the acrobat. Others include Ibrahim Helw, who handles lions at Agouza, and Mahasen and Mehta Helw, who work in another famous lion act in one of the circus' other two tents.

Of Moroccan origin, the Helws go back to 'Ali al-Helw of Marrakesh, who sent his two sons, Hassan 'Ali and Muhammad 'Ali, to Damietta in northern Egypt to work as agents for the importation into Egypt of ship laborers. But Hassan, who had once worked in a circus, began to import more than laborers for ships; he also began to bring in fire-eaters and acrobats from his native Marrakesh. A big man, and very strong, he also began to appear nightly in a Damietta music hall as a Strongman who ended each performance by holding a cannon in his arms as it was fired.

Since his son also turned out to be strong, Hassan engaged a Russian to train the boy as a wrestler. Later, the son became champion of Egypt and father and son formed a traveling circus. To assist them, they brought to Egypt an American lady called Madame Masarino who performed with a lion – the beginning of a Helw love-affair with lions.

One day Hassan presented himself to a visiting Moroccan circus. He explained he was good at training lions and horses and that he was the champion wrestler of Egypt. The Moroccans said they had enough animal acts, but could use him as a wrestler. Hassan explained he didn't want a job; he wanted an elephant. He got it, and then, with two lions bought from the Cairo zoo, enlarged his own circus. Since he also maintained his position as the wrestling champion of Egypt, the king, pleased with his exploits, gave him the title of "Bey." He became Hassan Bey 'Ali Hassan al-Helw.

As the years went by, however, running circuses became difficult and by the 1960s, competition from cinema and television – to say nothing of rising costs for animal food, transportation, costumes, advertising and salaries – were making it economically impossible for the private circus in Egypt to continue. Hassan Bey's solution was to seek help from the new Ministry of Culture which, under Dr. Tharwat Okasha, was already forming a new symphony orchestra, a ballet school, a puppet theater and a sound and light show at the Pyramids. The result was that Dr. Okasha decided to add the circus to his program.

Pursuing this, the ministry began to gather the best acts in Egypt and bring them together, and in the 1960s invited three Russian experts from the famous Moscow Circus School to help put together a new National Circus. Since then, the National Circus has never looked back. Today it is the most successful show sponsored by the Egyptian Entertainment Authority.

Though the third tent, under Mahasen Helw, is part of the National Circus, this remarkable woman insists that her act still follows the traditions of the old Egyptian Circus as developed by her famous father, Hassan Bey. She herself began in her father's tent when she was four years old as a tightrope walker and acrobat. The 20 lions in her tent belong to Mahasen personally and she and her 19-year-old son, Mehta, have created an animal act unique in circus history: into a cage with 10 lions, they bring a donkey, a dog and a monkey.

Nowhere else in the world, she says, has this been attempted – and there's even more to come. She's planning to add a snake and a crocodile.

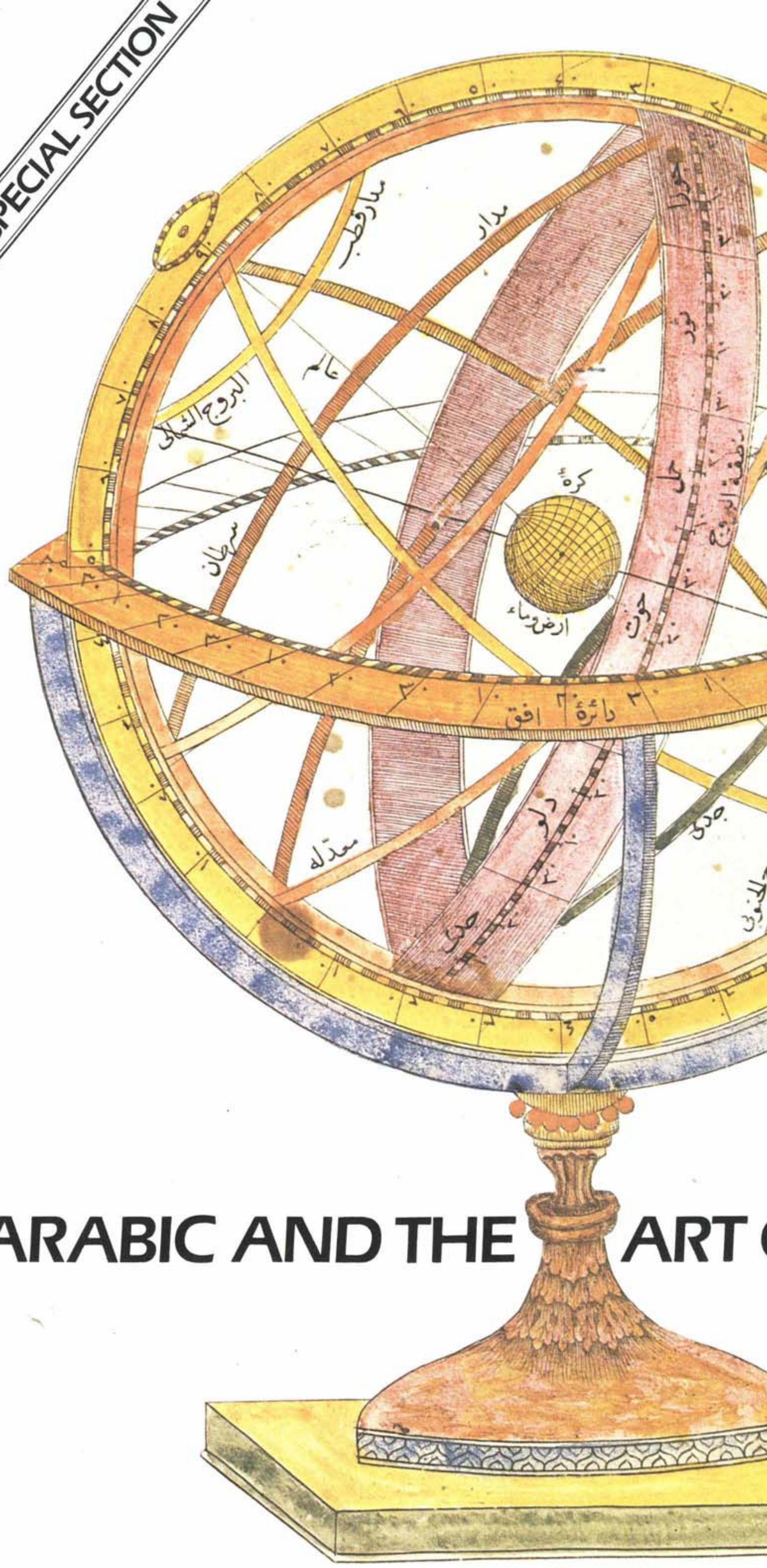
Under the cloak of the Egyptian National Circus then, the Helw's circus exploits continue: the precarious tumbling of Muhammad Saad's Aswan Seven, the daring flights of Muhammad Helw's acrobats, and Muhammad's, Ibrahim's and Mahasen's lions in three different tents.

All the acts, to be sure, are difficult and dangerous. But the animal acts are the most dangerous. One night, in the 1970's, Ibrahim Helw's father, Muhammad Ali al-Helw, was ordering his lions back into their cages when one turned, moved behind him, rose on its hind legs, grasped Helw in its paws, threw him to the ground, biting and clawing. Muhammad, the eldest son, drove the lion back, but three days later his father died from the wounds.

Still, the show goes on. Ibrahim, with 10 lions and a tiger, cracks two whips to get his animals to walk a tightrope, jump through burning hoops and, towards the end of the performance, to participate in a grand finale. Ibrahim kneels in front of one of the lions with a bit of food in his teeth and the lion eats from his lips. At this, the crowds clap and gasp in amazement. Man and beast, performing together, have again aroused fear, wonder and excitement – as the circus always has for 2,000 years.

John Feeney, writer, photographer and film producer, writes regularly for Aramco World *from Cairo.*

– A SPECIAL SECTION –



ARABIC AND THE ART OF PRINTING

1

ARABIC AND THE ART OF PRINTING

WRITTEN BY PAUL LUNDE

Illustrations courtesy of the Syndics of the Cambridge University Library and the Biblioteca Apostolica Vaticana.

INTRODUCTION

By 1980, the Computer Revolution – or Data Processing Revolution – had begun to transform world communications almost as drastically as the invention of movable type and the printing press in 1454, the rotary press in 1844 and the linotype machine in 1886. Indeed, Christopher Evans, in his book **The Mighty Micro,** flatly predicted that in the 1980's the printed word will slowly but steadily "slide into oblivion."

Dr. Evans, to be sure, based his predictions on devices still in the experimental stage: computer terminals the size of a book's page, automatic "page turning" and ceiling screens for comfortable reading in bed. But he also notes that practical "electronic newspapers" are already in existence – such as England's **Prestel,** that in 1980 began to provide up-to-the-second news, airline schedules and magazine articles for TV screens. And there is no denying that the introduction of computerized typesetting in the 1970's virtually eliminated the typewriter and the linotype machine from most American newspapers and publishing houses.

To some in the publishing and printing industries, such changes were as shattering an experience as the introduction of printing must have been to the medieval scribe. Suddenly forced to swap their battered typewriters and clanking linotype machines for the futuristic keyboarding and green-lettered television terminals of the computer, aging reporters, veteran editors and trained printers often quailed and quit. As so often happens, the casualties of progress were high.

But the trend is irreversible. Fast, silent and efficient, the computer saves time, reduces noise, cuts costs – and promises a transformation in communications as significant as the effects of the two seminal inventions in the history of communications: paper and printing.

Both paper and printing – which changed the worlds into which they were introduced – originated in the Far East, and paper at least was transmitted to Europe through the Islamic world. Like the invention of the alphabet itself, also of Eastern origin, the ramifications of both inventions were far reaching.

In today's print-saturated world, Gutenberg's invention of movable type may not seem as remarkable as it actually was. But given the technology of 1454, making typefaces was proportionately more difficult than making transistors – as J. Ben Lieberman makes clear in **Type and Typefaces.** Craftsmen had to cut out a mirror image of the shape of each letter on the end of a steel rod, hammer the outline of the steel "letter" into a flat piece of brass – to create a matrix – and carefully pour a molten mixture of lead, tin and antimony into the mold, thus creating a one-inch-high piece of "type" with one letter on the end.

This had to be done for each letter – and **one** page of Gutenberg's Bible needed up to 5,000 individual pieces of type. The new printers, therefore, had to have up to 25,000 pieces of type on hand – plus another 25,000 spaces to separate the type – if they wished to keep setting other pages while one was being printed.

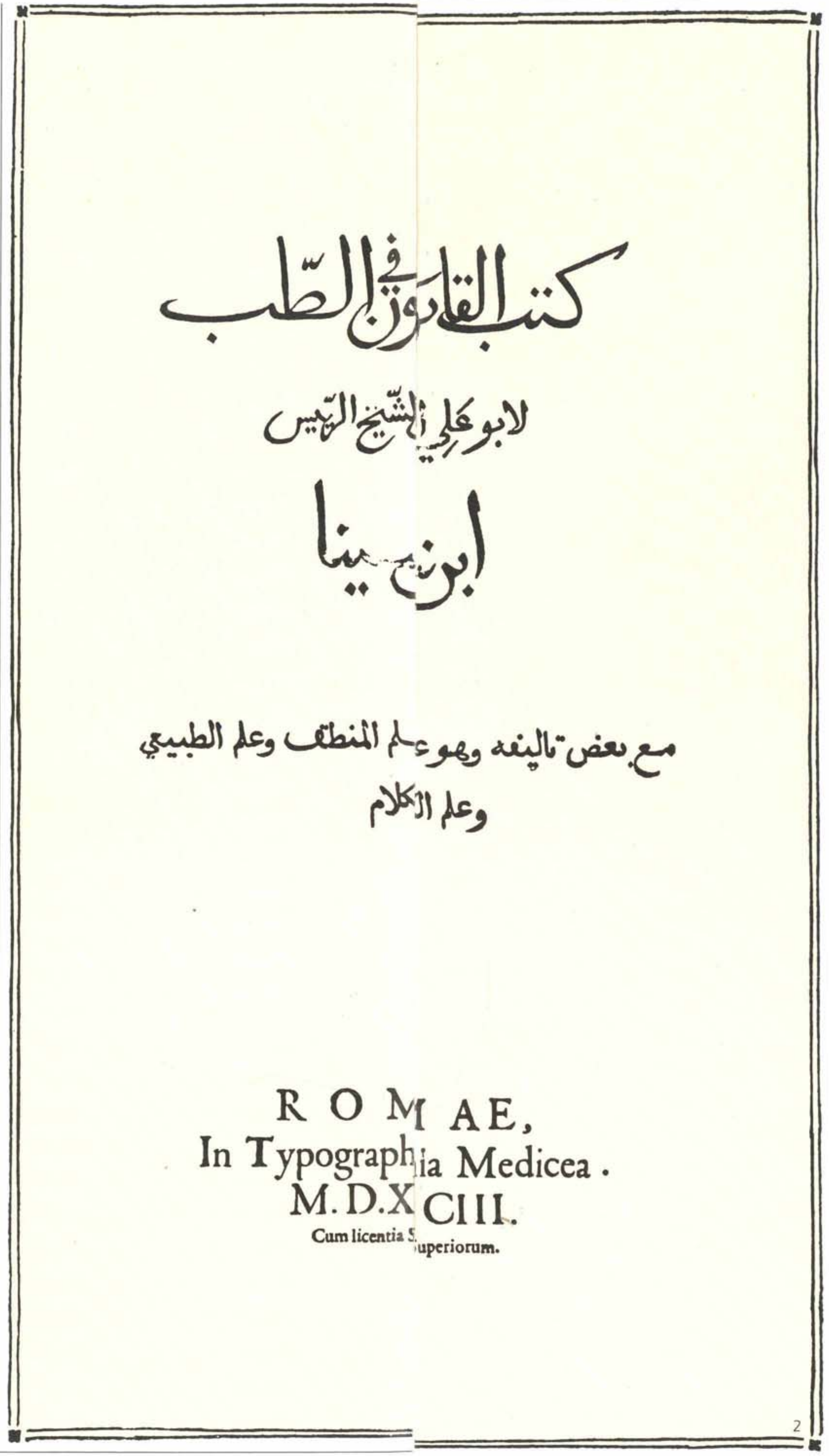
A pivotal advance, movable type, together with the printing press, made books – and thus literacy and learning available to the masses, a development that was to have incalculable results. Had Columbus been born earlier, for example, he probably would not have had access to such works as the writings of Ptolemy, which spurred him toward the discovery of the New World. Movable type was introduced just one year after the fall of Constantinople sent Byzantine scholars streaming into Italy – with their precious collections of Greek manuscripts – where the printing press provided a channel for the circulation of Greek learning throughout Europe.

Furthermore, printing from movable type, coming as it did at the peak of the Renaissance, was a key factor in the swift dissemination of advances in scientific, technological and industrial knowledge; it thus contributed to Europe's gradual emergence – first to equality, eventually to dominance – in a world long in the shadow of the Ottoman Empire.

Conversely, the absence of printing was an important element in the eventual decline of the Ottomans. Lacking printing, the Ottomans were slower to assimilate and circulate the new learning and thus, to an extent, failed to stay abreast of Renaissance Europe, particularly in technology.

Today, of course, printing is firmly established in the Arab world and Arabic typography is among the most interesting. Indeed printing, once it was established in the Arab East, developed almost as rapidly as it did in the West earlier – and has had similar results. This is the story of how that came about.

— The Editors



كتب القانون في الطب

لابو علي الشيخ الرئيس

ابن سينا

مع بعض تاليفه وهو علم المنطق وعلم الطبيعي
وعلم الكلام

ROMAE,
In Typographia Medicea.
M.D.XCIII.
Cum licentia Superiorum.

2

The Beginnings:

Historians generally credit Napoleon with introducing the printing press to the Arab world when he invaded Egypt in 1798. But though Napoleon did bring printing presses – and Arabic type – to Egypt, the story of Arabic printing is, in a sense, even older than printing. It begins in 1311, when the Papacy established chairs for the study of Arabic and other oriental languages at three European universities and at Rome.

This move – to encourage Arabic studies – was the result of a number of factors: Papal correspondence with the Mongol court (See **Aramco World,** January-February 1980), close ties with the Crusader states in the Levant, long-standing trade relations between the Italian maritime republics and the eastern Mediterranean and – the Papacy's prime interest – a desire to propagate the Catholic faith among the Arabic-speaking Christian communities of Syria, Lebanon and Palestine.

There were other, less political, considerations, too. Translations from Arabic – the language in which Greek philosophy and science had been preserved – were essential to St. Thomas Aquinas and other Christian theologians in their formulations of medieval theology and philosophy; to properly understand Aristotle, the foundation for much medieval thinking, theologians had to read translations of the great commentaries upon him composed in Arabic by such Muslim scholars as Avicenna and Averroes. But most were unsatisfactory.

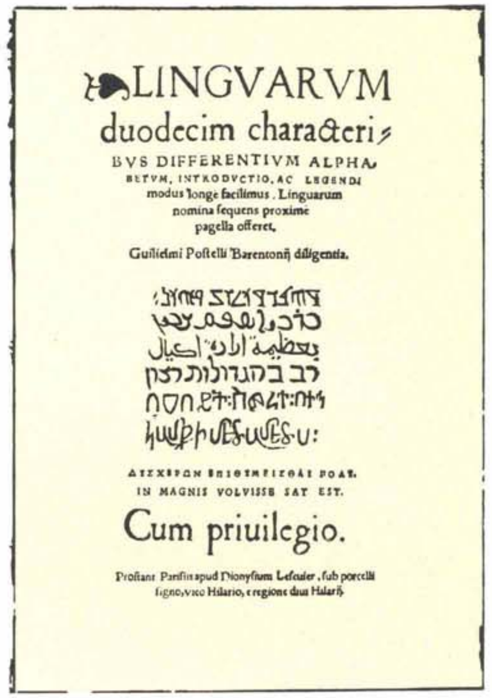
It is therefore not surprising that it was in Italy, the European country with the broadest interest in the Arabic-speaking world, that the first Arabic book was printed from movable type, in 1514.

Arabic type had been used sporadically before 1514, but no entire book printed in Arabic was produced until Gregorio de Gregorii, a Venetian, published a Book of Hours entitled **Kitab Salat al-Sawa'i,** probably for export to the Christian communities of Syria.

The book was not a great success. Though the borders, depicting arabesque flowers and birds, are charming, the type is crude: squarish, ill-formed letters that are unpleasant and virtually unreadable. It was, nevertheless, a bold attempt, as well as the first, to solve the problems of printing in the Arabic alphabet: designing and making – by hand – hundreds of characters and the connections between characters needed to duplicate the cursive nature of Arabic script. De Gregorii's typeface, moreover, was more successful than the Arabic type used by William Postel in his **Linguarum duodecim,** printed in Paris in 1538 **(See illustration 3)** or the eccentric face used in Rutgher Spey's **Epistola ad Galatas,** done in Heidelberg in 1583.

The man who did begin to solve the problems of Arabic printing was the French type designer Robert Granjon, whose name is still associated with a wide range of unsurpassed Latin and Greek typefaces – and the story of how he came to design Arabic type begins with the attempts by the Papacy to unite the Christian churches of the Levant with Rome. As these Christian minorities – Maronites, Greek Orthodox, Jacobite, Nestorian and Coptic – were strongly represented in the important trading centers of the Levant, Constantinople, Aleppo, and Alexandria, Pope Gregory XIII, in 1576, determined to make this connection spiritual as well as commercial. As a start he focused on the Maronites, who had particularly close commercial links with Italy. In 1584, he founded a Maronite College in Rome to train European missionaries in various oriental languages, and to train oriental Christians in the languages of Europe.

Responding enthusiastically, the Maronites threw themselves into the task of editing, writing, and translating books into and from Latin, Arabic and Syriac. But as it soon became obvious that the time had come to seriously undertake the printing of Arabic and other oriental languages, Gregory appointed Cardinal Ferdinando de Medici director of what came to be called the Medici Press. Cardinal de Medici, in turn, sought someone versed in oriental languages to oversee the operation of the press, and was lucky enough to find Giovan Battista Raimondi.



LINGVARVM
duodecim characteri-
BVS DIFFERENTIVM ALPHA-
BETVM, INTRODVCTIO, AC LEGENDI
modus longe facilimus. Linguarum
nomina ſequens proxime
pagella offeret.

Guilielmi Poſtelli Barentonij diligentia.

ΑΙΞΧΡΟΝ ΣΙΩΠΑΝ.
IN MAGNIS VOLVISSE SAT EST.

Cum priuilegio.

Proſtant Pariſiis apud Dionyſium Leſcuier, ſub porcelli
ſigno, vico Hilario, e regione diui Hilarij.

3

Giovan Battista Raimondi was the archetype of the Renaissance man: an accomplished classicist, a philosopher, a mathematician and a chemist. More to the point, he was also well qualified with regard to Arabic printing. During a trip to the East, he had learned Arabic, Turkish and Persian and collected grammars and dictionaries of those languages. He had also translated books from both Greek and Arabic, and written learned commentaries on Greek scientific works.

To set up an Arabic press, Raimondi rented some buildings on the piazza del Monte d'Oro in Rome, ordered presses, ink, paper and other necessary stocks and through a printer named Domenico Basa, obtained punches with which to cut an Arabic alphabet – punches designed by Granjon. Basa sold the punches to Raimondi and signed an agreement under which they would work together and share materials.

The first books printed under this arrangement – and bearing Domenico Basa's imprint – were the **Liber vii precationum** (1584), a book of Christian Arabic prayers, and the **Hortus rerum mirabilium** (1584), an historical work by Abu al-'Abbas Ahmad ibn Khalil al-Salihi, the full Arabic title of which is "The Book of the Garden of the Wonders of the World." This combination of Christian liturgical and Muslim scientific texts was also to be characteristic of the productions of the Medici Press.

Meanwhile, Raimondi had quickly realized that the success of the Medici Press would depend largely on the skill of Robert Granjon and to induce him to stay in Rome, offered a rent-free house, a stipend of 10 gold **scudi** a month, plus one gold **scudo** for every steel matrix he cut and a bonus of 300 **scudi romani** for every completed alphabet. Although he was 72 years old, Granjon accepted these excellent terms and set to work immediately.

In a few years Granjon had cut a large number of oriental characters, following superb calligraphic designs provided by Raimondi. On September 6, 1586, he completed the small Arabic typeface used for the text of the folio of Avicenna of 1593 **(See illustration 8)**. Legible and much more "oriental" in feel than those of de Gregorii, Postel or Spey, this face was not improved upon until the time of Ibrahim Muteferrika in the early 18th century.

Granjon, who died in 1589, was succeeded by Giovanni Cavaglion, who cut the medium and large Arabic alphabets used in the 1593 Avicenna chapter headings, as well as a small and a large Persian typeface, and a very beautiful Coptic alphabet.

Cardinal Ferdinando de Medici, in the meantime, formed a committee to direct the press and sent two specialists to Ethiopia and the Levant with orders to obtain Arabic, Syriac, Coptic and Ethiopic manuscripts of the scriptures. The manuscripts were to be used to establish critical texts of the Bible.

At the same time, the specialists were urged to collect Arabic scientific texts so that they could be printed and then exported to Muslim countries in order to acquaint Muslims with the advantages of printing. In 1587 two Italian merchants actually received a firman – a royal permit – from the Ottoman Sultan Murad III authorizing them to export Arabic books to the Ottoman Empire.
A copy of this firman was printed as the final sheet in the folio Arabic edition of Euclid

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ON PAPER

WRITTEN BY CAROLINE STONE

Without paper, or something like it, and without ink, printing would be virtually impossible and certainly impractical. Indeed, light, cheap materials to which ink could easily be applied, and an ink that **could** be applied, were as important in the history of printing as were movable type and the printing press.

In a sense, ink goes back to the prehistoric men who first painted on the walls of their caves with ochre, and to their descendants who used dyes from plants and sepia substances from squid, cuttlefish and octopi. But real ink was not developed until the Chinese and the Egyptians, having developed forms of writing, began to search for a substance with which to write and at some point discovered soot.

Until then, soot was just a nuisance. But scraped off cooking vessels and mixed with glue or gum – such as gum arabic – it produced dry molded sticks which scribes then mixed with water to create what is called carbon ink, India ink or Chinese ink.

Carbon ink, probably the earliest writing ink developed, is still used today, but over the centuries man also developed substitutes. During the Middle Ages, for example, ink in Europe was made with soluble iron salt. It was easier to prepare and could not be erased, but, since it contained sulfuric acid, ultimately destroyed the material on which it was applied.

Another ink was called **enkauston** – which was used by Byzantine emperors to sign their names and from which comes our word "ink." Various colored juices, extracts and suspensions of substances from plants, animals and minerals have also been used for inks including indigo, alizarin, pokeberries, cochineal and sepia. There is even a recipe for gold ink in a fourth century papyrus now in Leiden in The Netherlands.

With the advent of printing, it became clear that an oil-based ink was vital and the Germans, by mixing varnish or boiled linseed oil with carbon lampblack, developed such an ink. It was so successful that for more than 300 years it continued in use with little modification. Later, varnishes of varying stiffness were developed for different papers and presses, but it was not until the 20th century that ink-making became a complicated chemical-industrial process.

Paper is perhaps more important than ink, but its origins are less ancient. About the third millennium, the ancient Egyptians went down to the banks of the Nile and discovered an uncommon use for a common wild reed growing there.
The reed, of course, was papyrus and what the Egyptians discovered was that they could cut papyrus, extract its pith, and dampen and press it into sheets or long rolls. It was the first "paper."

The word "paper," in fact, is derived from "papyrus" – while the Greek word **khartes**, which denotes the papyrus leaf, became, in Latin, **charta**, meaning parchment, from which comes the modern English words "chart," "card," "charter" and the Arabic word for both parchment and paper – **qirtas**.

The first real paper, however, as distinguished from papyrus, was invented by the Chinese, about A.D. 105. It was made from tree bark, hemp rags and, one fifth-century history of the Han Dynasty claims, fish nets. The use of the new discovery spread quickly through China. Within 30 years of its announcement to the Chinese Emperor – in A.D. 105 – a Chinese could write: "I send you the works of the philosopher Hsu in 10 scrolls – unable to afford a copy in silk, I am obliged to send you one on paper."

Paper gradually moved west from China as new techniques increased production – and opened the way for different and finer varieties. By the fifth and sixth centuries, the manufacture of paper had spread into central Asia – a region which was then within the Chinese sphere of influence – and by the seventh century paper was being produced at Samarkand. Then, after the death of the Prophet Muhammad in the year 632, the nascent Islamic empire spread toward central Asia, where, after the defeat of a Chinese military force by the Talas River in 751, the secret of making paper was discovered by the Muslims. The 11th century Arab writer, al-Tha'alabi, says that paper was brought to Samarkand by Chinese prisoners, some of whom were paper makers. The prisoners, al-Tha'alabi wrote, began the manufacture of the new writing material in Samarkand and "thus it (paper) came to minister to the needs and well-being of all mankind . . . ."

Arab chroniclers say that the paper introduced into Samarkand was made from "grasses and plants" – possibly because, although the Chinese could make rag paper, raw materials such as paper mulberry, laurel, bamboo and Chinese grass were cheaper and more plentiful. The Arabs, on the other hand, ultimately favored rag paper made from hemp and linen – probably because the raw materials used by the Chinese were not readily available far from China.

It is uncertain where the Arabs themselves first made paper. One Arab historian says that the first Arab to use it for writing was the Caliph 'Umar at Mecca, and traditionally the Barmakid family, some of whom were viziers and scribes under the eighth century Abbasid caliphs, get credit for introducing the use of paper to Baghdad. But historians also know that Damascus was a major production center, and factories there produced much of the paper bought by Europe until the 13th or 14th centuries.

One thing, though, is indisputable: the use of paper spread quickly through the Islamic world. The new and vibrant civilization stimulated learning – and the growth of governmental bureaucracy – and the demand for cheap, abundant writing materials grew accordingly. Paper met those demands and by A.D. 1000, papyrus production had almost ceased.

Paper, however, was not immediately accepted for all uses. For a long time, copies of the Koran and other religious works were copied on vellum or parchment – partly for reasons of tradition and partly because these products were more durable. And in North Africa, parchment continued to be the medium for ordinary letters until the middle of the 11th century.

As for the rag paper produced by the Arabs, a doctor, originally from Baghdad, wrote rather disapprovingly about one source of rags in the 12th century: "The Bedouin and **fellah** search the ancient cities of the dead (in Egypt) to recover the cloth bands in which the mummies are bound, and when these cannot be used for clothes, they sell them to the factories which make of them paper destined for the food markets."
Surprisingly, cotton does not seem to have been used in the manufacture of paper until after the industry had reached Europe, although cotton was an important article of trade in the Middle East long before Europe had its own paper industry.

During the 11th and 12th centuries, Syria was the major Arab paper producing region. Factories turned out paper products in Tripoli, Tyre, Tiberias, Hama and, of course, Damascus. An 11th century Persian traveler wrote of Tripoli: "They make good paper here, like that of Samarkand, but of finer quality." From Syria, paper making spread to Egypt – where the nascent industry may well have supported those people put out of work by the declining papyrus industry – and from Egypt paper manufacturing spread across North Africa to Morocco, where Fez became the main center of production.

One anecdote, from the year 1145, shows how abundant paper was in Fez. When 'Abd al-Mu'min of the Almohads – a strict, reformist Islamic sect – took the city, the residents feared that the conquerors would destroy the lovely carved arabesques, adorned with gold and paint, which decorated one of the mosques. So they covered the entire interior with sheets of white paper until the walls appeared perfectly plain and attracted no undue attention. The ruse was successful.

From North Africa, paper making ultimately reached Spain and by 1150 al-Idrisi could write of the city of Xativa: "Paper is found there such as cannot be found anywhere in the civilized world, and is sent to the East and the West." This was the beginning of the export of paper to the Middle East, where Spanish paper was particularly prized for copying books because of its fine quality and durability. But the first paper document from Christian Europe is Sicilian, probably because Sicily was for several centuries under Muslim domination and had continuing contacts with the Arab world (see **Aramco World**, November-December 1970). This document is a deed of King Roger, dated 1109 and written in Arabic and Latin. The first manuscript on paper dates from 1154 and is still preserved in the archives at Genoa.

In Europe there was an initial resistance to the use of paper. The Emperor Frederick II, for example, forbade its use for public documents in 1221. But paper caught on anyway, and in 1157 a paper factory was established at Vidalon on the French side of the Pyrenees. Significantly, its founder, Jean Montgolfier, had learned how to make paper while he was a prisoner of the Muslims in Damascus.
In Italy, the first paper factory did not come on stream until more than a century later: in 1276. But it was not until the 14th century that Italy outstripped Syria and North Africa as Europe's main source of supply for paper.

During the Middle Ages paper making became one of the few large-scale industries as consumption soared and it became uneconomical to produce it in small workshops. A letter written from Lebanon in the 11th century, for example, mentions 28 camel loads – about 14,000 pounds – of Damascus paper being sent to Egypt as a single order. Historians say that of the 600 mills turning out various goods in Fez in the 13th century, 400 of them were processing paper.

The primary use of paper, of course, was as a material on which to write, but as early as the ninth century, Arab merchants in China had seen paper towels and even toilet paper – and in medieval times it was also used for packaging. Given the relatively primitive means of transporting goods in medieval times, this was important. Traders used paper, for example, to protect delicate goods, such as silk and coral necklaces, and in the 10th century Iraqi confectionery dealers wrapped sweets in paper. An 11th century writer also mentions citrus fruit – probably oranges – individually wrapped in paper, and a Persian traveler in Cairo, about the same time, wrote: "In the bazaar the grocers, the pharmacies and dry-goods stores provide the glass bottles, china jars and paper needed to hold or wrap what they sell. Thus, the buyer does not have to worry about containers for his purchases."

The advent of paper in the Muslim world also coincided with a great expansion in banking techniques. New and complicated financial transactions could not have been carried out without paper.

Another use of paper was initiated in 1294 by the Mongol governor of Khorasan; he tried to introduce paper money in Tabriz, the capital (See **Aramco World** November-December 1980). Government officials produced notes printed in Arabic and Mongolian, set up a network of centers for their distribution and, in an Arabic inscription on the notes, gave the date, warned off forgers and promised that "when these notes are put into circulation, poverty would vanish, provisions would become cheap and rich and poor would be equal."
It was an interesting idea, but it didn't work; two or three days after the notes hit the bazaars, the people of Tabriz were in revolt.

printed by the Medici Press in 1594. It is the first printed document in Turkish, and is set in Granjon's small Arabic typeface, with some modifications **(See illustration 4)**.

Because cutting the Arabic typefaces took such a long time, establishment of the Medici Press went slowly. Though the contracts formally setting up the press were signed on March 6, 1584, the first book to bear its imprint did not appear until 1591: it was a folio edition of 4,000 copies of the four Gospels in Arabic, a large edition for the time. The same Arabic text was reprinted, the same year, this time with an interlinear Latin translation by the Maronite scholar Gabriel Sionita, whose many works, including a short history of the Arabs, were among the earliest to be based on a first-hand knowledge of Arabic sources.


هذه صورة امر پادشاه اسلام السلطان ابن السلطان
السلطان مرادخان ٭

4

Once underway, however, the Medici Press was very productive. In 1592 it issued a prospectus of its Arabic type faces under the title **Alphabetum arabicum** – a 64-page masterpiece of design which not only displays Granjon's beautiful types, but contains a careful Latin Essay on the Arabic writing system **(See illustration 5)** – two classical works on Arabic grammar, the **Caphiah** (al-Kafiya) and the **Giarrumia**, (al-Ajurrumiya) and the abridged edition of al-Idrisi's famous geography (See **Aramco World**, July-August 1977), composed, fittingly enough, in Sicily in the 11th century **(See illustration 6)**.

The year 1593 saw the appearance of one of the most famous productions of the Medici Press: the folio edition of Avicenna's famous **Canon of Medicine** (al-Qanun fi al-Tibb), a beautiful book employing all three of Granjon's typefaces, the small, medium and large. The book itself had been the standard reference book on medical practice during the Middle Ages, both in Europe and in the Muslim world, and continued to be so through the Renaissance. **(See illustrations 2 and 8)**.

In 1594 the Medici Press published still another important work, the Arabic translation of Euclid **(See illustration 7)** with commentary by Nasir al-Din al-Tusi, the famous 13th century mathematician and courtier, thus providing, in the first few years of operation, coverage of medicine, mathematics, geography and grammar, the four subjects particularly cultivated by the Arabs.

Before the press actually published these works, however, the Grand Duke of Tuscany died and Cardinal de Medici, his brother, became the Grand Duke. This was a disaster for the Medici Press because the Cardinal moved to Florence, severed his ties with Raimondi and later, after the Arabic Gospels appeared in 1591, decided to sell the press. Worse, he also decided to sell the books, manuscripts, typefaces and unsold copies of the Medici publications.

Appalled at this, Raimondi bought the press himself, but quickly found he had purchased a white elephant. Books sent to the Frankfurt Book Fair in 1593 – then, as now, Europe's center for the distribution of books – did not do well. And the next year an employee of the press stole a large number of books and sold them cheaply at the fair, thus destroying the market for the remaining copies.


ALPHABETVM
ARABICVM

ROMAE
In Typographia Medicea.
M. D. XCII.

5

After Raimondi died in 1614, everything that remained of the Medici Press – paper stocks, type, presses, unsold books and the reference library of manuscripts – was transferred to the Villa Medici at the top of the Spanish Steps in Rome. All these materials were later transferred to Pisa, and in 1684 wound up in the Palazzo Vecchio in Florence. During these moves, some of the type and matrices had found their way to the **Propaganda Fide**, which used them for its oriental publications.


بسم الله الرحمن الرحيم

وبه الاعانة ٭ الحمد لله رب العالمين

امابعد اني وقفت علي الكتاب المسمي بنزهة المشتاق ٭ في احتراق الافاق ٭ وتاملت معانيه ومقاصده واستحسنت مصادره و موارده ٭ الا انه اكثر القول واعاد ٭ و نقص من ذكر بعض الاقالم وزاد ٭ علي حسب ما احب واراد ٭ فاخذت من كلامه ما وافق المراد ٭ وما به الحاجة ملجة الي معرفة المراسي والبلاد ٭ و من الله عز و جل اسال العون لا اله الا هو وهو حسبي ونعم الوكيل ٭

الكلام علي صورة الارض المسماه بالجعرافيا

فنقول ان الذي تلخص من كلام العلما ٭ وجلة الفلاسفة القدما ٭ ان الارض مدورة كتدوير الكرة و الما لاصق بها و راكد عليها والهوا يحيط بالما من كل الجهات ثم اخترم من الهوا ما ملس فلك القمر بسبب الحركة وانسباح المتماسين فهو النار المحيطة بالهوا متصاغرة

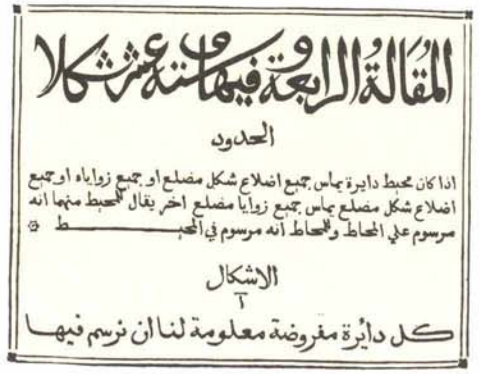
6

In the 18th century, amazingly enough, many of the books printed by Raimondi were still in the Palazzo Vecchio stacked in wardrobes. An inventory taken at the time shows that 1,039 copies of the Arabic-Latin Gospels, 566 of the Arabic Gospels, 810 of the Avicenna, 1,967 of the Euclid, 1,129 of the Idrisi, still remained unsold, along with several other titles. But early in the 19th century – the Age of Enlightenment – the government sold the remaining books for a derisory sum to a bookseller who destroyed the bulk of them to increase the rarity of the remainder. The remaining type and matrices wound up in the Pitti Palace, where Napoleon was able to loot them at his ease when he conquered Italy. In 1808 Napoleon ordered the punches and matrices to be taken to Paris, where they were used to print Arabic proclamations for distribution in the Near East (See illustration 14). Eight years later, after Napoleon's exile, they were brought back to Florence.

Meanwhile – in 1610, the year the last Arabic book came off the Medici Press – a book in Arabic was printed in the Middle East itself: the famous **Quzhayya Psalter** – the Bible's book of psalms.

The **Quzhayya Psalter** is a small folio containing 260 pages, each divided into two columns, the right-hand column containing the Syriac text, the left-hand column the Arabic translation printed in a smaller Syriac typeface. At the bottom of the page, in the colophon, are clues to the story of the Psalter. It reads: "Printed in the honored monastery of Wadi Quzhayya, on Mount Lebanon, the work of master Pasquale Eli and of the humble Yusuf ibn 'Amima from Karm Sadde . . . 1610."

Pasquale Eli was an Italian printer while Yusuf ibn 'Amima had been a student at the Maronite college in Rome, and was a member of a delegation sent to Rome in 1610. Since his name appears in the colophon, it is probable the delegation brought back a press to print the psalter. This psalter was unique – since no other books followed from the press at Quzhayya – and almost a century was to elapse between the printing of the Quzhayya Psalter and the next book printed in Arabic in the East – this time in the Arabic alphabet.


المقالة الرابعة فيها ثلثة عشر شكلا

الحدود

اذا كان محيط دايرة يماس جميع اضلاع شكل مضلع او جميع زواياه او جميع اضلاع شكل مضلع يماس جميع زوايا مضلع اخر يقال للمحيط منهما انه مرسوم علي المحاط والمحاط انه مرسوم في المحيــــــــط ٭

الاشكال

آ

كل دايرة مفروضة معلومة لنا ان نرسم فيها

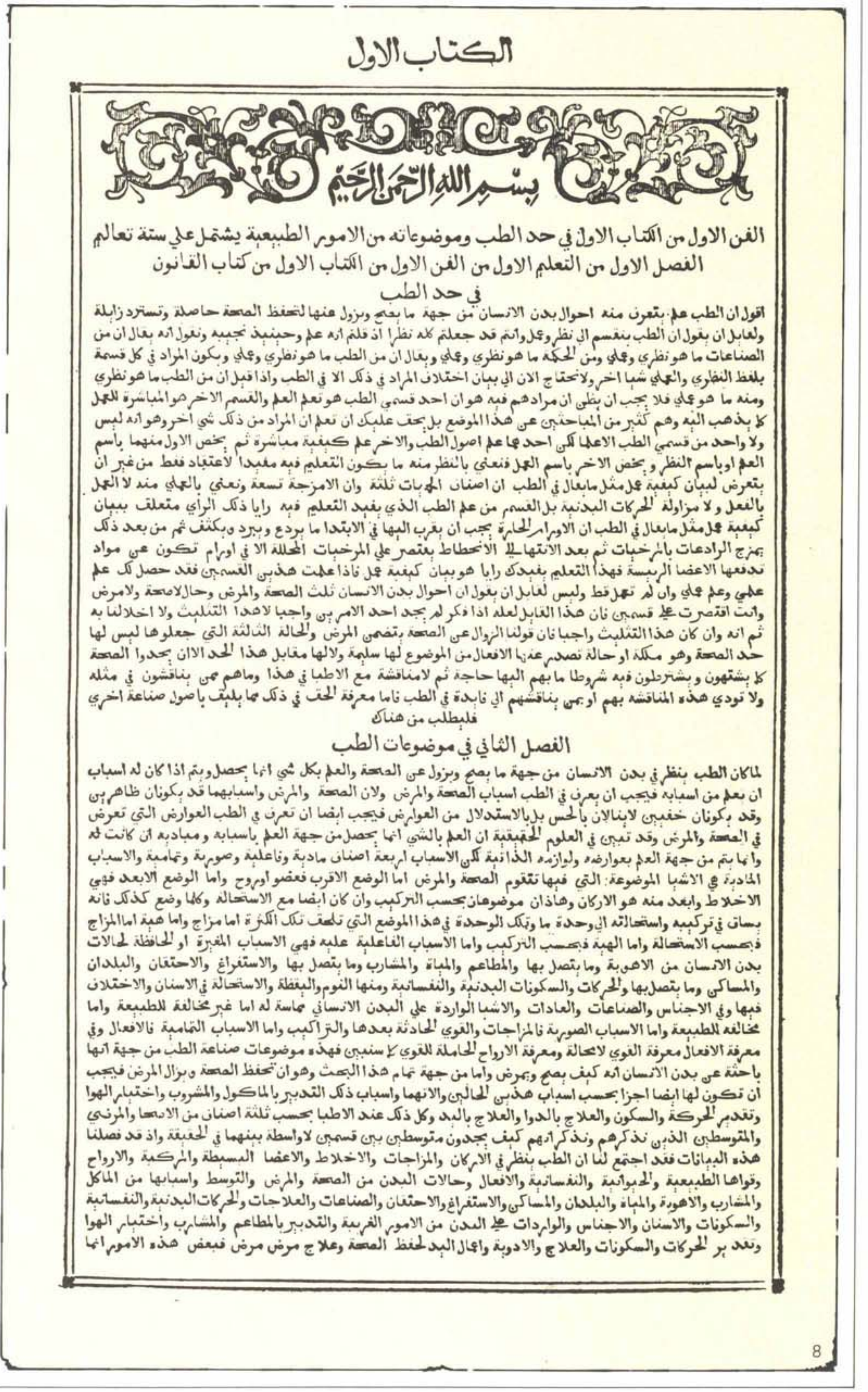
7

Strangely enough, this took place in the Ottoman protectorate of Walachia, now in Romania, where the Greek Orthodox Patriarch of Syria, Athanasius Dabbas, set up a press which printed liturgical works in Arabic; they are now among the rarest of printed Arabic works. In 1704 Athanasius returned to Aleppo and established a new Arabic press, at which, it is said, 'Abd Allah Zakhir, an apprentice goldsmith, with the help of his brother, not only set up the press, but engraved all the matrices, made the tools, and cast the type; all without ever having seen a printing press in operation.

In the story of Arabic printing, 'Abd Allah Zakhir played an interesting role; his first typeface was used in 1706 to print a Psalter and though the letters are crude, two more books were printed with it. But then he abandoned it and cut two new faces – both more elegant and closer to the **naskhi** style of Arabic handwriting – which were used in the edition of the **Paracletic** published in 1711. Between 1706 and 1711, some nine titles were printed by the Aleppan press.

Inexplicably, after the publication in 1711 of a treatise by the Patriarch himself, the press in Aleppo suddenly ceased operating, but Zakhir later set up another press at Choueir in Lebanon, and once again set about cutting type molds and founding his typeface. The press itself was brought from Europe, and in 1734 he printed his first book; this press continued to be used at the monastery of Saint John at Choueir until 1899.

Like his contemporary Ibrahim Muteferrika, 'Abd Allah Zakhir had to overcome difficulties which would have proved insurmountable to a lesser man. With no formal training, he mastered a difficult craft without teachers and with few guides. But his true importance is that he was the first man to print books in Arabic with movable type in the Middle East.


الكتاب الاول

بسم الله الرحمن الرحيم

الفن الاول من الكتاب الاول في حد الطب وموضوعاته من الامور الطبيعية يشتمل علي ستة تعاليم
الفصل الاول من التعليم الاول من الفن الاول من الكتاب الاول من كتاب القانون
في حد الطب

فليطلب من هناك

الفصل الثاني في موضوعات الطب

8

A MISSING LINK

WRITTEN BY PAUL LUNDE

In the late 19th century, amid a collection of papyrus and paper documents found in the Fayyum oasis in Egypt, a scholar named Karabacek made an astonishing discovery: fragments of block printed Arabic texts.

Along with others that have come to light in European and American libraries subsequently, these texts should have revolutionized theories about the development of printing. But the discovery has never been publicized and only rarely discussed, outside a small circle of specialists.

The earliest of these texts may date back to the 10th century; some are printed in two colors, and all show a wide variety of calligraphic styles: from an archaic-looking Kufic to an elegant **naskhi**. One example is printed on a linen envelope while another contains the first six verses of the 34th Sura of the Koran.

But their significance lies in the fact that the fragments are **printed**; in effect the discovery challenges the long-held Western belief that the Islamic world blocked the transmission of printing from the Far East to Europe. Indeed the Fayyum fragments suggest just the reverse; instead of **barring** the transmission of printing processes, the Islamic world might have been the means by which those processes **did** get to Europe.

Printing is traditionally attributed to the invention, by an obscure German named Gutenberg, of a method of printing books with movable type and the publication, in 1454, of the **Türkenkalender**, a pamphlet warning European leaders of the growing power of the Ottoman Empire. It was published one year after the armies of Mehmet the Conqueror breached the walls of Constantinople and one year before Gutenberg printed his famous Bible.

Actually, the art of printing goes back long before Gutenberg to China, where paper was developed in the second century, and to Japan, where an oil-based ink was first produced in the fifth century. Vital to the art of printing, the development of paper and ink enabled the Empress Shotoku of Japan to produce the first printed work known in history: a million copies of Buddhist prayers, produced on single sheets by the process of block printing between A.D. 764 and 777.

Block printing – the antecedent of movable type, linotype and the word processor – used wooden blocks on which the text to be reproduced was carved in relief, inked and transferred by pressure to a sheet of paper.

It is virtually certain that this process was known to the Chinese even earlier. In any case, the Chinese can claim the first known printed book in history: an edition of the Buddhist work, **The Diamond Sutra**. Dated May 11, 868, this book, like the prayers of the Empress Shotoku, was block printed, a method so successful for printing Chinese characters that in 932 a Chinese government official, Fong Tao, sponsored a block printed edition of 300 of the classics of Chinese literature.

The Chinese, furthermore, having seen the advantages of wood block printing, began to experiment with still other methods of book production, and in the 11th century a man named Pi Sheng invented movable type – 400 years before Gutenberg. Pi Sheng's characters were made of clay and set in a matrix which could be melted so that the type could be re-used. By the middle of the 13th century, printing with movable type was also being done in Korea, and in 1313 the Korean ruler Wang Chen ordered a type font containing 60,000 characters, each a single character in wood. The earliest extant book printed with movable type is Korean and bears the date 1361. These breakthroughs, however, were not the direct antecedents of Gutenberg's invention.

In fact, block printing, the precursor of both the Chinese and the German systems of movable type, entered Europe only shortly before the time of Gutenberg. To historians, this has always posed a problem. Why didn't the Islamic world transmit the technique of block printing to the West? Though a political barrier between the Far East and Europe, Islam, after all, had preserved and transmitted the mathematics, the science and the philosophy of the ancient Greeks to the West, as well as the process of making paper. Why then did Islam not transmit such an eminently useful technique as block printing?

One theory was that because the reproduction of images was forbidden in Islam, printing was never adopted in Muslim lands, and was therefore not passed on to the West. But this theory ignores several points. Muslims. for example, accepted the use of seals which are based on the same principle as block printing, and, like the Chinese, stamped their seals of ownership on letters, documents and on the first and last pages of their books. The Prophet himself had a seal ring which bore the legend "Muhammad, Messenger of God."

The same argument applies to the process of coining. A punch or die is used to reproduce identical copies of a design, often incorporating a religious text, and Muslim rulers since early Umayyad times had issued coinage. Why then, since the principles are the same, would the Muslims accept seals and coinage, but reject block printing?

Furthermore, there is no prohibition against images in the Koran, and though some Muslims opposed figural art in some places at certain periods, they generally objected only to 3-dimensional sculpture.

Muslims of the early 14th century were perfectly acquainted with Chinese printing, as the famous historian and statesman Rashid al-Din, vizier to Ghazan Khan, the Mongol ruler of Iran, made clear in the first volume of his world history in 1307 (See **Aramco World**, January-February 1981). The Chinese, he said,

> . . . make copies of books in such a way that no alterations can creep into the text. When they want any book containing important material to be well written and correct, authentic and unaltered, they order a skillful calligrapher to copy a page of that book on a tablet in a fair hand. Skilled engravers are then ordered to cut out the letters. When they have thus taken a copy of all the pages of the book, numbering all the blocks consecutively, they place them in sealed bags, like the dies in a mint, and entrust them to reliable persons keeping them securely in offices specially devoted to this. When anyone wants a copy of this book he goes before a committee and pays the dues and charges fixed by the government. They then bring out the tablets, stamp them on sheets of paper like the dies used in coining gold, and deliver the sheets to him . . .

Illustrations courtesy of the Syndics of the Cambridge University Library.

In his history, Rashid al-Din also gave an example of printing in Iran itself. In 1294, Ghaikhatu, the Mongol ruler of Iran, issued block printed paper money, bearing inscriptions in both Arabic and Mongolian. As it turned out, issuing paper money proved disastrous: the merchants distrusted it, the army refused to accept it and riots broke out. Nevertheless, the experiment shows that wood block printing was known in the Muslim world in the late 13th century – almost a century before it reached Europe. Finally, there is the discovery of block printed texts in the Fayyum oasis – which suggests that the Muslim world **was** able to make block prints as early as the 10th century – not very long after the first known block printed books from China.

The importance of this discovery – though overlooked until now – should not be minimized. Quite simply, it destroys the long held Western theory that the Islamic prohibition against images prevented Muslims from either adopting block printing or transmitting it to Europe – as they did other discoveries such as paper.

To the contrary, the Muslims may have provided the route by which block printing did get to Europe. There is an old story about an Italian brother and sister who produced a block printed edition of the Romance of Alexander the Great in Italy in the 13th century, following a process imported from Egypt; in the light of the Fayyum discovery, it deserves to be re-examined.

The Fayyum texts, it is true, contain no complete books. What survive are single sheets of paper, parchment and, in one case, linen. But the earliest of them may date to the early 10th century – just about the time Fong Tao was producing his edition of the Chinese classics – and the latest dates back to 1350, a few years **before** the first European block print. The fragments, moreover, are attractively designed and laid out, and make use of two-color printing, red and black. The scripts cover the whole range of Arabic calligraphy, from an archaic Kufic to an elegant **naskhi** – suggesting that Arabic printing in Egypt was the product of long evolution and must have employed a number of craftsmen.

Admittedly, the inference to be drawn from these finds is hard to accept: that the history of printing has been substantially wrong for centuries. Arabic literature, after all, contains no references to Arab printing. On the other hand, the block prints from Egypt provide irrefutable evidence that the Islamic world possessed the technique of block printing before Europe. These block prints are, in effect, the missing link in the evolution of printing.

The Ottoman Contribution:

Five years before 'Abd Allah Zakhir set up his own press, a momentous event occurred in Istanbul, capital of the Ottoman Empire. In January, 1729 – the same year Benjamin Franklin's recently formed printing house received its first government contract – the first book printed in the Arabic alphabet under the auspices of an Islamic government came off the press.

It was momentous because it signaled official recognition of the disturbing decline of Ottoman power – and of the importance of printing in the rise of European power. It also signaled a victory for the man who, more than any other, persuaded the Ottoman Sultan that only wide dissemination of Europe's scientific and technological knowledge could enable the empire to arrest the decline – and founded a press to do so. This was Ibrahim Muteferrika, the Benjamin Franklin of the Muslim world.

Born about 1674, Ibrahim Muteferrika was an extraordinary combination of soldier, scholar, diplomat and writer who, as a child, may have witnessed the long disconsolate retreat of the great Ottoman army from its unsuccessful siege of Vienna – the inescapable sign of the decline in Ottoman military might.

The reasons for the decline were many and complex, but to Ibrahim Muteferrika and other far-sighted men, the solution was not. They believed that unless European military innovations were adopted, the antiquated Ottoman army would be unable to defend the Empire, and that the only route to such reform was rapid and wide dissemination of the scientific ideas which underlay European military power. In short he thought the Ottomans must establish a printing press and translate key European works into Turkish.

These ambitious plans were more easily made than carried out. Aside from the technical problems of obtaining materials, either buying or cutting an Arabic typeface – since Turkish was then written in Arabic script – and learning the craft, there was the problem of the immense conservatism of the Ottoman state. Although Hebrew and Armenian presses had existed in Constantinople for a long time, no one had ever printed with Arabic type. It was perfectly possible that the innovation would be opposed simply on the grounds that no one had done it before.

Fortunately, Ibrahim had two powerful allies. These were Mehmed Chelebi Pasha Yirmisekiz and his son Sa'id, who in 1721, had returned from a diplomatic mission to Paris filled with enthusiasm for various aspects of French culture – among them printing – and had conveyed this enthusiasm to the Sultan and his court. Eventually, therefore, the Grand Vizier, Ibrahim Pasha, encouraged Ibrahim Muteferrika to address a petition to the Sultan – which Ibrahim did in the form of an essay entitled **Wasilat al-Tiba'a,** "The Utility of Printing."

"The Utility of Printing" is a remarkable document. It opens with a closely reasoned warning on the importance of preserving a nation's laws – and on the difficulties of doing so.

Ancient peoples, Ibrahim argues, engraved their laws on tablets or wrote them down in books, but throughout history both tablets and books have been destroyed – one reason why Muslims carefully guarded the text of the Koran and the Traditions by making copies and circulating them among the believers, who learned them by heart.

Unhappily, Ibrahim goes on, even the power of the state cannot always protect books from the ravages of war. Genghis Khan and Hulagu, the Mongol conquerors of the 12th century, in destroying the empire of the Abbasids, burned or spoiled all the works of art and science which they found – and the Christians captured thousands of irreplaceable books when they conquered Muslim Spain.

These events did irreparable harm to Muslim learning, Ibrahim writes, because while the Christians retained possession of a great number of Arabic works on the useful sciences, the Muslims were deprived of them forever. "All of these considerations should be borne in mind when considering the utility of the establishment of a printing press in Constantinople."

Ibrahim goes on to list his specific aims: Arabic is the language of science; Turkish speakers need good dictionaries to acquire the language; printing can produce such dictionaries, as well as works on astronomy, philosophy, history and geography cheaply and exactly.

With printed books, Ibrahim argues, scholars and students can be sure of the faithfulness of their text to its original, and will be spared the laborious job of collating manuscripts.

Moreover, he goes on, the ink used for manuscripts is effaced by dampness, while printer's ink, which is oil-based, is impervious. As printed books are cheap, both poor and rich can now devote themselves to study without worrying about the costs. Since public libraries in the provinces can be supplied with printed books, learning will thereby be spread throughout the Empire.

Ibrahim also points out that there are many Muslims throughout the world who are not Ottoman subjects and printing could supply them with books by which they might instruct themselves.

"The famine of books will be at an end. All nations will be able to acquire books at low cost. What glory for our Empire, and what prayers for its perpetuity will be made, when they see so many good books which communicate knowledge to them, of which till then they had been destitute. This motive alone should suffice for our Invincible Emperor to protect and permit the establishment of printing."

In the course of his enumeration of the advantages of printing, Ibrahim also casts a critical eye on the products of European presses which had printed Arabic books.

"European rulers have recognized the importance of works written in Arabic, Persian and Turkish, and have printed books in all languages ... but ... the books are filled with errors and the type is ugly...."

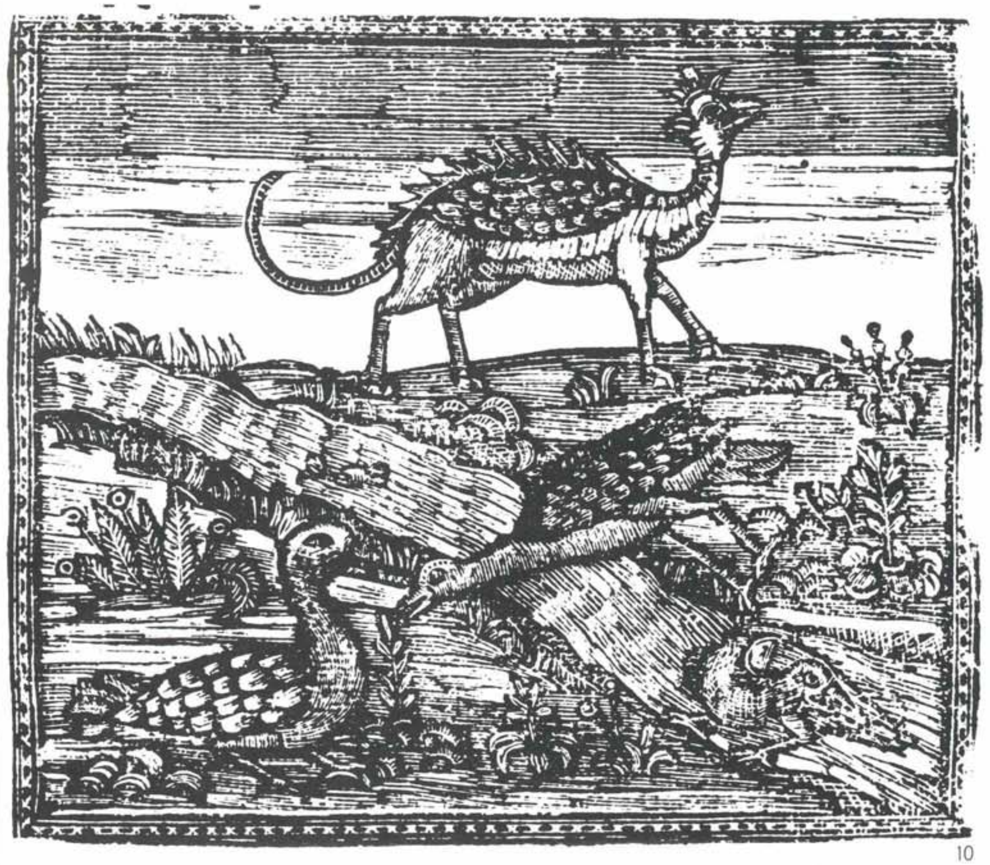
But, he goes on, this too is an argument for setting up a printing press in Constantinople. "If these European presses should cut type based upon a good oriental hand, the trade in their books will prove detrimental to our interests, for money will flow from us to them.

"It is therefore vital for the Muslims," he concluded, "formerly in advance of the West in the sciences, not to let themselves be eclipsed by them."

When the Sultan Ahmed III received Ibrahim Muteferrika's petition, he submitted it to the Mufti, Shaikh 'Abd Allah, the leading authority on Islamic law, with this question: "A certain man has cast metal letters in order to print the classical works of literature and science, such as dictionaries, works on logic, philosophy, astronomy, and so on, and has offered to undertake to print them. Can he, in accordance with the rules of justice, execute his design?"

Shaikh 'Abd Allah's response – very like a Supreme Court decision – was yes, he could: "If such a one has mastered the art of printing the aforesaid works correctly with metal characters, providing a sure means of saving work and of making multiple copies at low cost, thus making their acquisition easy and less costly, then I rule that this art, because of its great advantages, must be encouraged. In order to avoid misprints, able and intelligent men must be chosen, who, before the books issue from the press, shall correct them, by comparing them with the best available manuscript texts."

9



10

Far from opposing the innovation, then, the religious authorities welcomed it. But as they naturally stipulated that every effort should be made to avoid misprints, the government appointed four eminent qadis as proof-readers – the first in Islam to undertake this laborious and thankless task. The authorities also ruled that only secular works might be printed – to protect the more than 4,000 professional copyists of Constantinople, whose work consisted almost entirely in copying the Koran, the collections of canonical traditions, and legal texts.

Shaikh 'Abd Allah's decision was issued in 1726, but it was more than two years before Ibrahim was ready to print; he first had to gather materials, learn how to print and design and cut the type.

Some historians assume that Ibrahim imported his Arabic typeface from Europe, but Ottoman documents unequivocally state that Ibrahim designed and cut his type himself – and it is certainly different from European Arabic typefaces of the same period. It is closer to **naskhi,** the standard book hand of the Muslim world, very similar to typefaces used in the Middle East today, and, for several reasons, a remarkable achievement.

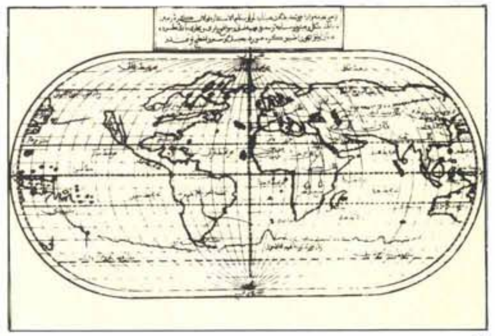
Printing with the Arabic alphabet involves a number of difficulties which are not found with the Latin alphabet, or even with other Semitic alphabets. One is that each Arabic letter has four different forms, depending upon its position in the word, and another is that Arabic is a cursive script – that is, most letters are linked to the preceding and following letter by a ligature, which varies in both length and direction. A third problem is that since calligraphy is the supreme Islamic art, (See **Aramco World,** July-August 1977), readers tend to be critical, even of legible type faces, on esthetic grounds. Today for example, few readers are entirely happy with the computerized type in Arabic newspapers. Yet Ibrahim, working with no training or technical background, not only produced a legible type face, but one that pleased his readers. When the first book rolled off the presses in1729, the Mufti who had authorized its printing wrote, "This book must be regarded as a pearl."

The book referred to was a Turkish translation of an Arabic dictionary, in two volumes, the first containing 666 pages, the second 756. Known as the **Sahah** ("The Correct"), it was composed in the 10th century by al-Jawhari, and is one of the classics of Arabic lexicography. It contains more than 22,000 root words, and each usage is illustrated by quotations from the poets.

The second book, a maritime history of the Turks by the great Ottoman writer Hajj Khalifa, was less formidable: only 150 pages long. But like the two volumes of the **Sahah,** it was issued in an edition of 1,000 copies – a large printing for the time – and contained five illustrations: one showing the two hemispheres, another showing the Mediterranean and the Black Sea, another the islands under Ottoman rule, the fourth a map of the Adriatic and its islands, and the fifth a double mariner's compass, beautifully engraved, with the names of the winds in Turkish, Persian and other languages. These illustrations testify to Ibrahim Muteferrika's skill as a map maker and engraver.

The **Maritime Wars** also contains information on cities, ports, borders, islands and sites of important naval battles; it gives an account of Ottoman naval battles in the Archipelago, the Black Sea, the Red Sea, Arabian Gulf and the Gulf of Venice, lists famous Ottoman admirals, including Piri Reis, (See **Aramco World,** January-February 1980) and describes different methods of navigation.

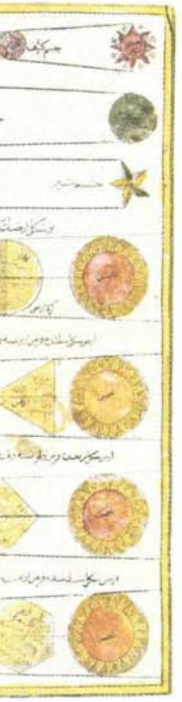
Another interesting book published by Ibrahim Muteferrika was a history of the discovery of America. Printed towards the beginning of April, 1730, it is the first Islamic printed book with figural illustrations. Based partly on Latin sources, the **History of the West Indies** contains an introduction on the geographical views of ancient writers – showing their ignorance of the New World – and then gives an account of the Spanish discoveries, including fabulous stories of the flora and fauna of the New World, illustrated by 13 prints **(See illustrations 9 and 10),** and four maps **(See illustration 11),** engraved by Ibrahim.



11

One of the most important books which came off the press in Constantinople was written by Ibrahim Muteferrika himself, and was devoted to the decline of the Ottoman Empire which had led Ibrahim to found the press in the first place. Called the **Nizam al-Umam,** ("Ordering of the Nations"), this book was written to convince the Sultan and the court to introduce European tactics and organizational methods into the Ottoman army.

This book was both bold and innovative. By stressing the need for order and written legislation in the governing of a nation, and in discussing political and military geography and European military arts, tactics and weapons, Ibrahim, in effect, was criticizing the Ottoman's proud and powerful military complex. Although the book seems to have had little effect, it marks one of the first stages in the modernization of Turkey.



12

Ibrahim's press also published the **Jihan-Numah,** ("Mirror of the World"), by Hajji Khalifa, the same man who wrote "The Maritime Wars of the Turks," – probably the most beautiful book in its catalog, as well as the most ambitious. Published on July 3, 1732, it contains 698 pages, and 39 illustrations (**See illustrations 1 and 12**), among them 24 maps.

It also includes the first discussion in the Islamic world of the ideas of Galileo, Copernicus, and Tycho Brahe. Based on both European and Islamic sources, it gives the latitudes and longitudes of many Asian towns with greater accuracy than any previous work, and for this reason was much esteemed by European cartographers. In the Preface, Ibrahim Muteferrika makes a plea for printing up-to-date maps. "Otherwise", he says, "we will make no progress in the science of geography."

The last book printed by Ibrahim, like the first, was a dictionary, this time Persian-Turkish. It was printed in 1742, 13 years after the foundation of the press. Three years later, in 1745, Ibrahim Muteferrika died and the press virtually ceased production until 1783, when, with the help of two old men who had worked with him, printing in Turkey was revived, this time to stay.

FACING THE FUTURE

WRITTEN BY JOHN MUNRO

Since the invention of printing in the 15th century, artists, technicians and typographers have constantly experimented with new type designs to make the printed page easier and more attractive to read. But typographers in the Arab world, despite similar efforts, have always faced much more difficult problems than those in the West.

Printing in a Western European language, which uses the Latin alphabet, involves approximately 60 letter forms, including small letters, capital letters, commas, apostrophes, dashes and so forth. Printing in Arabic, however, depending on the typeface used, can involve up to 450 forms – more than seven times as many.

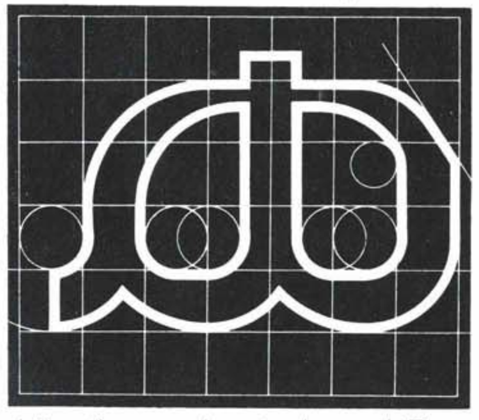
It is not that the Arabic alphabet contains many more letters than does the Latin; there are 28 letters in the Arabic alphabet as opposed to 26 in the Latin. But most letters of the Arabic alphabet have four different forms, depending upon their position in the word – that is, whether they come at the beginning, middle, end or stand in isolation. This, of course, is a result of the cursive nature of Arabic script; many of the same problems would result from an attempt to print a European cursive hand. In Arabic, for example, the letter h, or "ha", may appear in any of the following forms:

ه ـه ـهـ هـ

In practice, however, some letters have **more** than four different forms, depending on the shape of the letter which **precedes** and **follows** them. The letter **m** for example may appear in as many as 73 different guises.

In most cultures, handwriting developed from the printed form of the language. Arabic, however, has been cursive from the beginning; with only a few exceptions the letters forming each word must be joined to each other and there is no such thing as "printing" in Arabic, for the letters cannot stand in isolation. It is the printing of the ligatures which join the letters, attached as they are at different points, that makes printing Arabic so difficult.

Gutenberg, when he set his famous Bible in Mainz more than 500 years ago, only needed **one** basic piece of type for each letter of the alphabet – not counting, of course, multiple forms of the same letter – while in 1849, when the American Mission Press in Beirut printed an Arabic Bible, no less than 900 characters were used – and even this number was felt to be insufficient. The closer the printer wishes to approximate elegant handwriting, with its variations in the size and height of the letters, the more characters he needs. The great complaint leveled by Ibrahim Muteferrika against the productions of the Medici Press was that the Arabic type was inelegant; he was referring to the restricted number of basic letter forms which gave the page a mechanical look inconsistent with the canons of Arabic calligraphy.



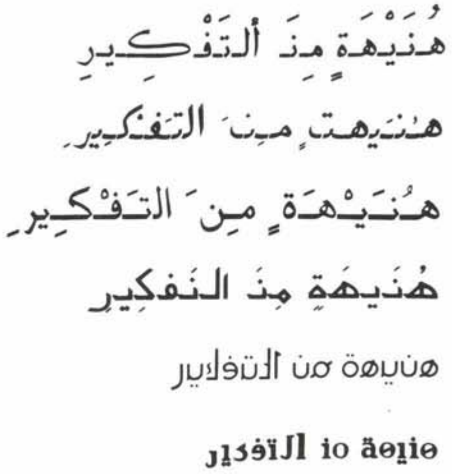
As long as printed texts in Arabic were set by hand, composition was slow and laborious, but still quite practicable. Once the typesetter had familiarized himself with the physical positions of the multiplicity of characters on his working table, he would pursue his task and eventually produce a frame of type for printing – although in a much longer period of time than his Western counterpart.

The real challenge to Arabic printing came with the introduction of mechanical composition – the linotype machine by which typesetters, at a keyboard similar to that of a typewriter, typed out a full column-width line of type **in metal.** A Western invention designed to facilitate the printing of texts in **Western** languages, linotype keyboards were constructed to utilize the number of characters used by Western printers – and were therefore not readily adaptable for printing Arabic script.

Fortunately, however, linotype machines had larger keyboards than those of an ordinary typewriter, as they were designed to accommodate two fonts at the same time: Roman and Italic, or Roman and Bold. This meant that there was room for the integration of about 120 characters within the machine, and a Lebanese immigrant journalist in the United States, Salloum Mkarzel, noticing this, was able, after World War I, to compose his Arabic daily **Al-Huda** on a linotype newspaper machine utilizing 122 forms.

In the 1950's the late Kamel Mrowa, a publisher in Lebanon, reduced Mkarzel's font to 88 characters and until its demise during the recent civil war in Lebanon, the daily **Al-Hayat** was regularly printed with it. As a result of such advances, Arabic linotype machines have developed rapidly in the Arab world during the past 20 years.

But as Arabic linotype machines were being introduced in the Arab world, along with monotype setting, type-setting technology in the United States and Europe was changing again. The most significant development was undoubtedly the introduction of a process whereby the text is set photographically; a computer-controlled light, flashing through a filmed letter, registers it directly on a sheet of film, like a lens registering a photograph on film. These new systems are at least 10 times faster than the old linotype process which stamped the letters in metal.



Six of the 266 proposed simplified Arabic alphabets submitted to the Academy of the Arabic Language in Cario between 1933 and 1968.

Illustrations from Roberto Hamm, **Pour une typographie arabe** © (1975), published by Sindbad in their collection **La Bibliothèque Arabe.**

In Arabic printing, computerized typesetting is distinctly superior to the linotype since the computers' "matrices" are capable of accommodating as many as 600 letter forms, even though the keyboards have remained essentially the same size as those of traditional composing. More important, filmed type faces and computer science can produce the correct form of a particular Arabic letter, whose design is determined by the letters which precede and follow – freeing the compositor from having to decide himself which form to use. On these new machines, Arabic texts can now be typeset more rapidly and more correctly than ever before.

In spite of such dramatic innovations, there are still problems. Since Arabic printing techniques have until very recently been adaptations of Western technology, little research has been done into the **readability** of various Arabic type faces.

Though Arabic typography has reflected changes of esthetic taste, a script pleasing to the eye is not necessarily the most readable. In the West considerable research has been undertaken to design fonts that are both elegant and easy to read, but whether these discoveries have relevance for Arabic readers is not yet known, and more research is needed to ascertain the Arabic reader's response to the variety of type faces with which he is daily confronted. Are the typefaces difficult to read? Do they slow reading speeds? Is there a serious esthetic loss?

From the beginning of Arabic type design by Raimondi and Granjon in 16th century Italy, typographers have unanimously based their type faces on some form of the Arabic calligraphic style called **naskhi** – and most still do. But as typefaces have developed, they have tended to become heavier and less attractive, and are now a far cry from the elegant **naskhi** hand of the calligraphers, with its irregular heights, gentle stems, and delicate curves. As a result newspaper headlines are usually the work of calligraphers rather than typesetters, because the ugliness of present-day types tends to be accentuated when enlarged. In many modern newspapers, moreover, a wide variety of calligraphic styles is used in addition to the **naskhi** form used for most of the text. Arab children learning to read must, therefore, learn to distinguish between a multiplicity of variations in the forms of their alphabet.

The problems – and challenges – of Arabic printing are of serious concern to typographers, printers and educators throughout the Arabic-speaking world.

Recently, serious efforts – including open competitions – have been made to seek new solutions to the problems of Arabic type design. Anyone who is able to design a simplified, elegant standardized type face, which compositors can use quickly and effectively, and readers readily understand, will make a significant contribution to the art of typography.

Napoleon in Egypt:

In 1798 Napoleon, fresh from the conquest of Italy, decided to invade Egypt – to gain naval control of the eastern Mediterranean and cut Britain's route to India – and in May the French fleet set sail from the port of Toulon for Alexandria.

Two months before the departure of the fleet, Napoleon gave orders to pack the Arabic, Greek and French type of the Imprimerie Nationale and ship it to Toulon, and on April 3 also arranged to send the famous press of the **Propaganda Fide** and its oriental typefaces to Egypt. So by one of history's curious coincidences, one of the presses intimately associated with the birth of Arabic printing in Europe was destined to introduce Gutenberg's art to the land of the Pharaohs.

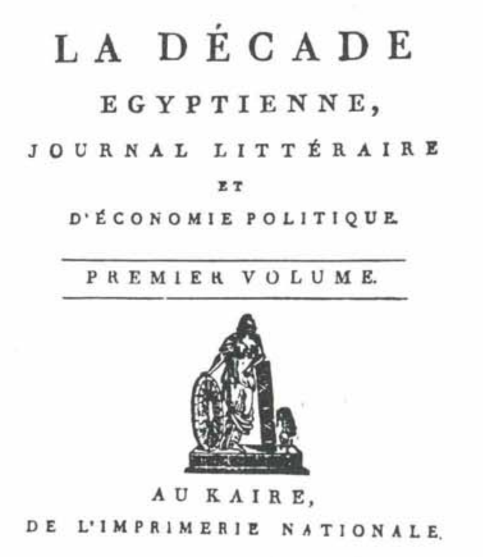
Napoleon took a personal interest in packing and shipping of the presses and the type and in recruiting 34 printers, translators, and typesetters. His correspondence is full of urgent requests relating to all these matters, and no detail was too small to escape his attention. It may seem odd that the commander of a military operation, beset with thousands of details, should have been so concerned with printing. The answer is that Napoleon was one of the first modern leaders – for better or for worse – to systematically make use of printed propaganda, which he had used for the first time during his Italian campaigns. He planned to use the same methods in Egypt, and quiet the fears of the populace by distributing pamphlets and proclamations assuring the Egyptians that he came not as their conqueror but as their liberator.

He had other, more elevated motives, too. Like Alexander the Great, another famous conqueror of Egypt, Napoleon took with him a large group of **savants** – historians, geographers, engineers, linguists, orientalists, astronomers and physicians – whose mission was to prepare a complete description of the climate, flora and fauna, antiquities, architecture and languages of ancient and modern Egypt. The result was the **Description de l'Egypte** (See **Aramco World** March-April 1976). By doing so, Napoleon perhaps sought to justify his invasion in the eyes of Europe. The reports of the various **savants** were to be printed in Egypt, and perhaps translated into Arabic to acquaint the Egyptians with European science. These plans were only partially fulfilled, for the French stay in Egypt was short, and it was not until long after the armies of Napoleon had left the banks of the Nile that the **Description de l'Egypte** was printed.

Two men were put in charge of the presses. One was the orientalist Jean Joseph Marcel, grandson of a former French Consul in the Levant, and the other was Marc Aurel, an old

friend of Napoleon, who met him as a young man in Valence where his father printed a newspaper.
French scholars have sought to determine which of the two men should be credited with introducing printing to Egypt. In fact, the first Arabic printed document of the French expedition was not printed on Egyptian soil at all, but on the high seas – on board the aptly-named **Orient** under the supervision of Marcel, the expedition's official printer.

This first document was a proclamation by Napoleon intended to reassure the inhabitants of Alexandria; it was read aloud to a number of Egyptians who were forcibly taken on board the flagship in the harbor of Alexandria the day before the debarkation of the troops, and the city's capture, on July 1.


LA DÉCADE
EGYPTIENNE,
JOURNAL LITTÉRAIRE
ET
D'ÉCONOMIE POLITIQUE.
PREMIER VOLUME.
AU KAIRE,
DE L'IMPRIMERIE NATIONALE.

13

Copies were also distributed throughout the city, and on July 7, the day Napoleon left Alexandria for Cairo, he left explicit instructions that the press be set up in the house of the Venetian Consul, who was expelled for the purpose.

Meanwhile, Marc Aurel, the expedition's private printer, accompanied Napoleon to Cairo, and soon began printing the first journal in the Arabic speaking world, the **Courrier de l'Egypte,** a political journal, published every 10 days, in French, for the occupying troops. The first number appeared on August 28, 1798. Later Marc Aurel also began printing the more interesting **La Décade Egyptienne,** a literary journal, until Napoleon, dissatisfied with the number of typographical errors it contained and its poor style, decided to bring the presses in Alexandria to Cairo, and to replace the discredited Marc Aurel with Marcel.

It was not until October that the presses arrived in Cairo. The delay, oddly enough, was caused by the difficulty in hiring enough camels to carry all the cases of type and the presses. Finally, Marcel decided to send everything by boat, and the press was set up in Azbakiyah Square, in the same building which housed the **Institut d'Egypte,** the headquarters of the scientific expedition. But it was still some time before printing could begin. Towards the end of November, we find Napoleon writing once more to Alexandria, asking for "forty cases of type" to be sent on to Cairo. Eventually, though, on January 14, the press was ready and the new **Imprimerie Nationale** began to turn out both the **Courrier** and the **Décade.**

Under Marcel, **La Décade Egyptienne (See illustration 13)** presented articles on art, architecture, antiquities and medicine, as well as chronicling the cultural life of Egypt during the French occupation. The most interesting articles are those by Marcel himself.
He printed his own translations, accompanied by learned notes – which gave him a chance to show off the variety of oriental typefaces he had brought from Rome – of Arabic texts relating to Egypt and other scholarly topics. In 1799 he published a small edition of the fables of Luqman (See **Aramco World,** March-April 1974) in Arabic, one of the few full-length Arabic books to be printed by the French expedition. Another was a treatise on smallpox by a French doctor, which the contemporary Egyptian historian al-Jabarti described as "not bad of its kind."

What impression did printing make on intellectual circles in Egypt? It is commonly assumed that the presses of Napoleon were the first ever heard of in Egypt. This is not so. Al-Jabarti's detailed history of the French invasion, of which he was an eyewitness, often mentions the printed announcements distributed by the occupying power, but he evinces little surprise at the process itself. The Coptic communities had been using printed Arabic liturgical works sent from Rome since 1738, and there is little doubt that Ibrahim Muteferrika's pioneer experiment was well known in Egypt.

Still, there was a difference between knowing of a new process and actually seeing it in operation. An article appearing in the **Courrier** for February 13, 1801 gives some information of how printing struck educated Egyptians: "Of all the things which have excited the astonishment and admiration of the inhabitants of Egypt since our arrival in their country, the thing which has made the most impression upon them … was the art of printing. Last year, the principal members of the government, among them the Shaikhs al-Muhdi, al-Fayyumi, al-Sawi and others, came many times to the **Imprimerie Nationale** and there saw with a mixture of pleasure and surprise … the various processes of printing, both in French and in oriental languages. Shaikh Muhammad al-Fasi, who had already seen printing in Constantinople, and several Syrians who knew the press established in … Kisruwan (Choueir) among the mountains of the Anti-Lebanon, were also astonished at the speed and precision with which the French printers worked … Shaikh al-Bakri, who had not yet seen the **Imprimerie Nationale,** came several days ago to visit the establishment. After having satisfied his curiosity … he asked several questions about the art of printing. Among other things, he asked if France had many printing presses, and whether they existed in other European countries as well, and if so, in which were they most numerous? When his questions had been answered, he asked if printing existed in Russia, and was astonished at the answer that that country had not begun to become civilized until the introduction of printing. He then asked what influence printing had on the civilization of a people, and seemed to understand, and approve of, the answer that was given him, above all: (1) the ease of multiplying many copies of good books, which in manuscript could only be known to a few and (2) the impossibility that all these copies should be lost or destroyed under any conceivable circumstances – a thing which can easily happen to manuscripts. He then said that there existed a great number of good Arabic books whose publication would be infinitely useful to the country, where most people were unaware of them, and that he sincerely desired that they reach a wider audience through printing. He left saying that all the sciences came from God, and that if God wished, there was nothing men undertook that they could not succeed in."

Those officials, it turned out, were not the only Egyptians to see the utility of printing. Four years later – after the French forces had left – a young military officer came to power and, realizing the importance of education, began to put printing in Egypt on a firm foundation. His name was Muhammad Ali.


بسم الله
الرحمن الرحيم
حوادث
الحرب الواقع بين الفرنسوية والنساوية
هذا خطاب القيصر المعظم
قيصر فرانسا وملك ايطاليا قبل سفره للحرب
الي مشيخة الفرنسوية
يا ايها المشايخ اعلموا ان الاحوال التي وقعت فيها بلاد الافرنج
هي الزمتني ان احضر بينكم لاعرفكم بمرادي ه ها انا مسافر من

14

The Bulaq Press:

In the history of modern Egypt, few men have contributed more than Muhammad Ali. A young officer when Napoleon came, Muhammad Ali seized power in 1805 – four years after the French left – eliminated the Mamluk aristocracy, asserted his independence of Ottoman rule and, perhaps more important, established the Bulaq Press, a symbol of modernization for the Middle East.

Though poorly educated himself, Muhammad Ali soon saw the need for massive reform if Egypt was to successfully oppose both the might of the Ottoman Empire and aggressive European adventurers like Napoleon. He also realized that the key to the modernization of Egypt lay in education along Western lines, particularly in practical, technical subjects like shipbuilding, engineering, mathematics and medicine, and in 1809 he sent the first of what were to be many missions of Egyptian students to Europe.

Little is known of this first mission except the name of one of the men who was sent – 'Uthman Nur al-Din, who later became the first director of the Bulaq Press. 'Uthman spent five years in Italy, mainly in Pisa and Leghorn – both at the time ruled by the Grand Duke of Tuscany – whose ancestors had done so much for Arabic printing in the 16th and 17th centuries – went on to Paris, and returned to Egypt in 1817 with huge orders of books on technical subjects.

Meanwhile, it had become obvious to Muhammad Ali that the system of schools he had established could not function without printed textbooks, and in 1815 he sent Nicolas Musabiki to Rome and Milan to study type-founding and printing. Muhammad Ali also ordered three presses from Milan – along with the necessary paper and ink from Leghorn and Trieste – and, when Musabiki returned, made him manager of the Bulaq Press, working under 'Uthman Nur al-Din. The press itself, in the meantime, had been established in the old Nile port of Bulaq, now a suburb of Cairo, and shortly afterwards, the second, and largest, student mission – it numbered 44 students – had returned from Paris. These men, under the leadership of Rifa'a Bey Rafi' al-Tahtawi, had studied French with a view to the translation of technical books into Arabic. The most prolific of these translators turned out to be al-Tahtawi himself.

Al-Tahtawi had been educated at al-Azhar University, then and now the most prestigious center for the study of the Islamic sciences in the Muslim world. There was apparently no opposition by the Shaikhs of al-Azhar to the innovation of printing; we have already seen how enthusiastic Shaikh al-Bakri had been about the **Imprimerie Nationale** of Napoleon. Muhammad Ali attached several professors from al-Azhar to the Bulaq Press to learn the art of printing; one became head of the foundry, another printer-in-chief, and others worked as compositors and proof readers.

Between 1822 and 1842, the press at Bulaq published 243 titles. A glance at these is the quickest way of seeing where the interests of Muhammad Ali and his reformers lay. By far the largest number of books – 48 – were on military and naval subjects. Muhammad Ali had seen both the French and the English fleets in action, and realized how vulnerable Egypt was to invasion from the sea. He had also noted how successful the modern arms of the French had been against the antiquated weapons of the Mamluks.


كتاب
الدّرر الغوال فى امراض الاطفال
(بسم الله الرحمن الرحيم)
يامن خلق الانسان من سلالة من طين * ثم جعله نطفة
فى قرار مكين * ثم خلق النطفة علقة * ثم جعل العلقه
مضغة * ثم جعل المضغة عظاما ثم كسى العظام لحما
ثم انشأه خلقا آخر تباركت يااحسن الخالقين * نحمدك
على ما اوليتنا من الانعام * ونشكرك على لطفك بنا فى ظلمات

15

Interestingly, though, the next largest category of books published by the Bulaq Press was poetry. Twenty-six works of poetry in Turkish, Persian and Arabic were published in the first 20 years of the press' operation; clearly the men associated with the Bulaq Press were as interested in traditional Islamic literature as they were in translations of European works on military tactics. After poetry comes grammar, with 21 titles, mathematics and mechanics, with 16, medicine with 15 and veterinary medicine with 12. The rest of the books published by the press were on religion, botany, agriculture, political administration and so forth **(See illustration 15).**
In 1836 Muhammad Ali opened his famous School of Translation in the Azbakiyah quarter, not far from where Napoleon's **Imprimerie Nationale** had been set up. The following year al-Tahtawi was appointed director, and over the next 20 years he wrote or translated at least 38 books, on everything from mining technology to the history of ancient Egypt. Many of these were published by the press in Bulaq.
The School of Translation was faced with almost insurmountable linguisitic problems. The translators had to find Arabic equivalents for western technological terminology, and in many cases their informants – Italians, Frenchmen and Turks – did not speak Arabic. Some books were first translated from French into Italian so that an Italian-speaking doctor could help prepare a rough Turkish translation that could then be turned into Arabic and revised by the professors from al-Azhar. Under these conditions, one can only marvel at the productivity of these pioneers of the Arabic linguistic revival.

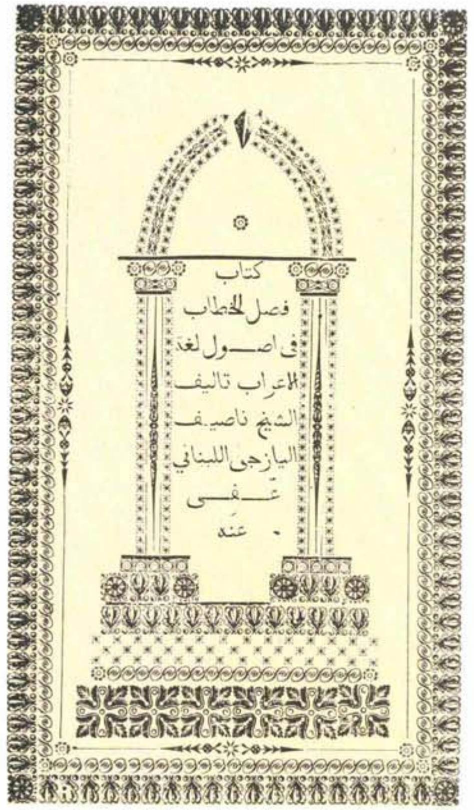
The only book produced by the Bulaq Press which tells us anything of what the men who took part in the modernization of Egypt under Muhammad Ali thought and felt is al-Tahtawi's engaging account of his stay in Paris. This is much more than a simple travel book; it tells us a great deal, both implicitly and explicitly, about the impact of 19th century European society on a traditionally educated Muslim. Al-Tahtawi was enthusiastic about many aspects of French society, less so about others. He was impressed by printing, education and public works, but found much to criticize, particularly in the sphere of morals. He liked the intellectual ferment of France, and the openess of the people to new ideas: "The Parisians," he says, "are distinguished among the Europeans for the subtlety of their intelligence, their vivacity and the depth of their understanding. They love to know things in depth, and are only convinced in argument by definite proof. Even ordinary people know how to read and write. They think deeply about things, and every man forms his own ideas. They compose books on all subjects, even the most mundane, such as cooking, which means that even craftsmen must know how to read in order to acquire a complete knowledge of their craft. Every craftsman seeks to create something never thought of before or to perfect another's invention … The Parisians are curious, and have a passion for novelty. They love change in all things, particularly fashion, which changes all the time."

In 1862, the Bulaq Press passed into private hands and by the end of the century its monopoly of printing in Egypt had been broken as a number of privately owned presses were established. Its importance, however, cannot be exaggerated. The Bulaq Press was at once a symbol of modernization in the Middle East and a concrete source of the books – technical translations as well as famous classics of Arabic literature – that spread literacy, speeded development and paved the way for the development of modern Arabic literature.

An American Contribution:

While the Bulaq Press was being founded in Egypt, another important Arabic press was set up on the island of Malta by a group of American Protestants, and that press, in turn, spawned what would become the most influential Arabic press after the Bulaq Press: the American Press of Beirut.

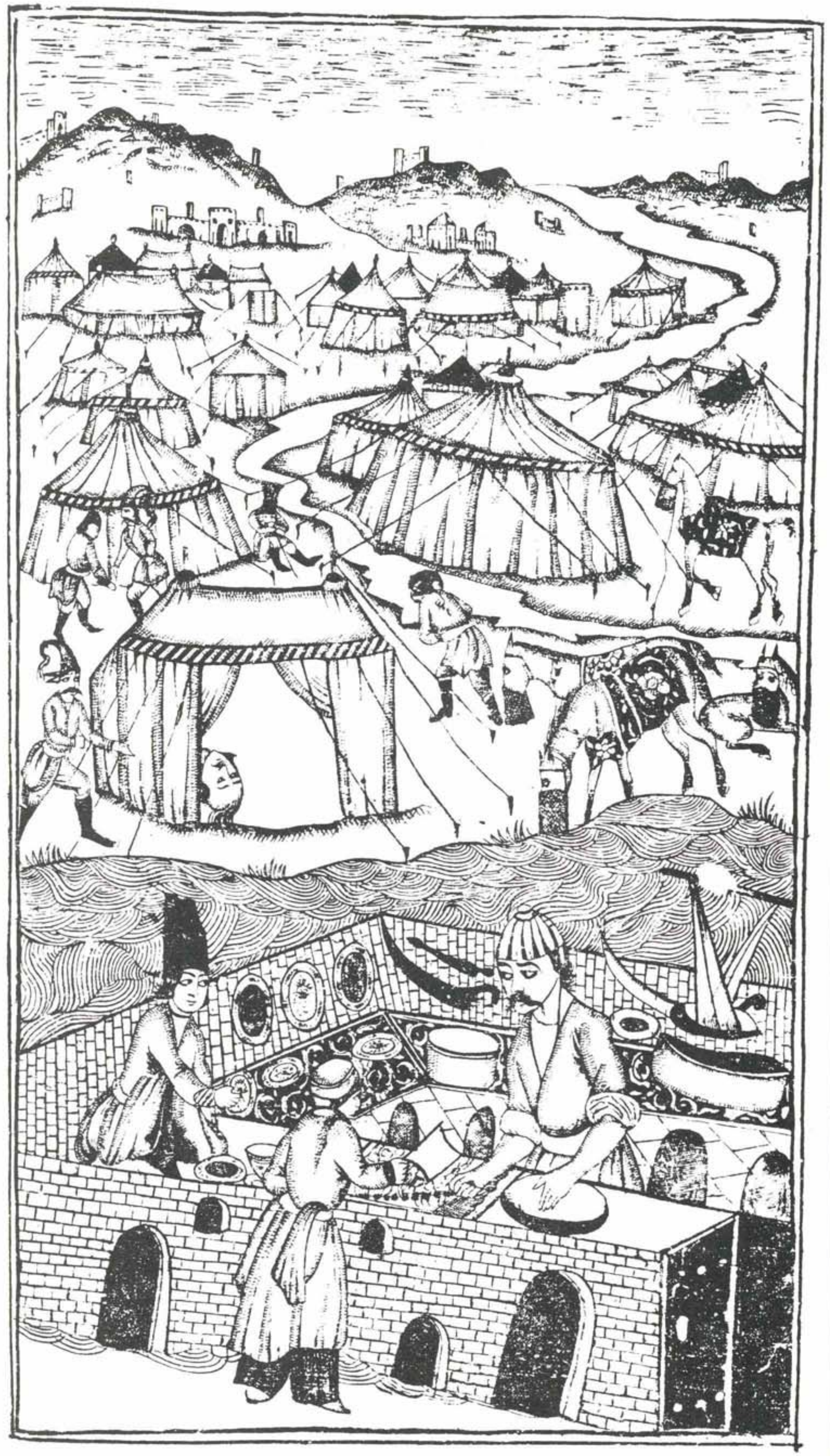
The press in Malta was in operation for 20 years – during which it published some 20 titles, both secular and religious, including a book by 'Abd Allah Zakhir, the first Arabic printer in the Middle East, and involved a man called Faris al-Shidyaq, later a key figure in the renaissance of modern Arabic literature and the first newspaper editor in the Middle East.



كتاب
فصل الخطاب
في اصول لغة
الاعراب تاليف
الشيخ ناصيف
اليازجي اللبناني
عفى
عنه

16

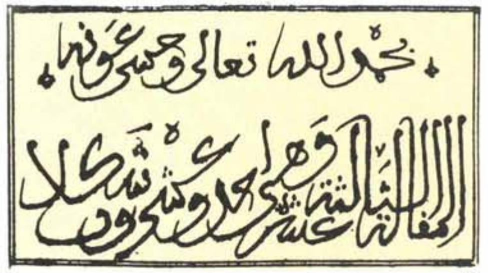
In 1833 Eli Smith, the assistant director of the press in Malta went to Beirut and installed a printing press in his home near Bab Ya'qub. This press – the American Press of Beirut – was to become one of the most productive and important Arabic presses in the Middle East. Under the directorship of Dr. Cornelius van Dyck, who succeeded to the directorship in 1857 the American Press of Beirut probably reached the widest audience of any in the Middle East by publishing writers in the forefront of the Arabic literary revival like Ibrahim al-Yaziji, whose Arabic translation of the Bible won a gold medal at the Paris exposition of 1878. By 1922 the American Press had turned out the unbelievable total of 1,240,000,000 printed pages in Arabic, English, French, Turkish, Armenian, Persian and Kurdish. **(See illustration 16.)**



17

The Lithographed Book:

The 19th century also witnessed another innovation in printing technology that greatly affected Arabic book production – the introduction of lithography in the 1820's. Because lithography allows the exact duplication of handwriting, it was of particular importance in the Muslim world, which was never very happy about the look of Arabic type. It is no accident that it was in areas of the Muslim world which did not habitually employ the script called **naskhi** – such as India, North Africa and Iran – that lithography was most popular; it permitted the reproduction of the visual nuances of calligraphy **(See illustration 18).**



بحمد الله تعالى وحسن عونه
المقالة الثالثة عشر وهي احدى وعشرون شكلا

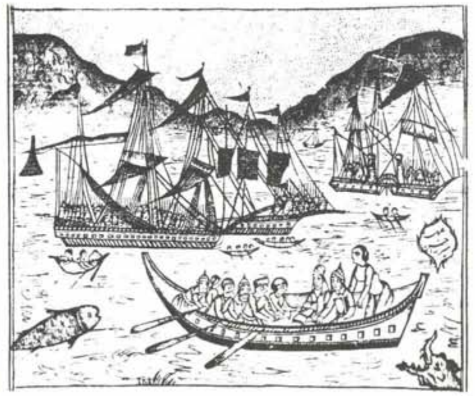
18

Some of the lithographed books produced in the 19th century are very beautiful indeed. They were often written out on the lithographic block by famous calligraphers, and some of them, with their hand-colored title-pages and decorative borders, are almost indistinguishable from manuscripts. Lithography was thought particularly suitable for printing the Koran, for many pious Muslims felt that since the Koran was in every sense "scripture", it should be written out by hand.

In India and Iran, where Arabic printing had been introduced in 1814 and 1817 respectively, the lithographed book almost became a traditional craft. Abdul Halim Sharar, the noted Urdu author, has preserved some details of early 19th century lithography in his fascinating book **Lucknow: The Last Phase of an Oriental Culture**: "At first printing was not undertaken on a commercial basis but purely as a private pursuit. The finest quality paper, highly appropriate for lithography, was used and the best calligraphists were employed at high salaries. They were shown great favor without any stipulations as to working conditions or how much they wrote in a day or even whether they wrote anything at all. In the same way the printers were never asked how many pages they had printed in a day. For the ink, thousands of lamps of mustard-oil were lighted to produce fine-quality lampblack. Instead of acid, fine-skinned lemons were used and sponges took the place of cloth. In short, only the finest materials were employed. As a result, Persian and Arabic educational and religious books in the days of the monarchy could not have been printed anywhere else but in Lucknow, where they were produced, irrespective of cost, for discriminating eyes. Books printed at that time represent a fortune to those who possess them. People search for them but cannot find them."

19

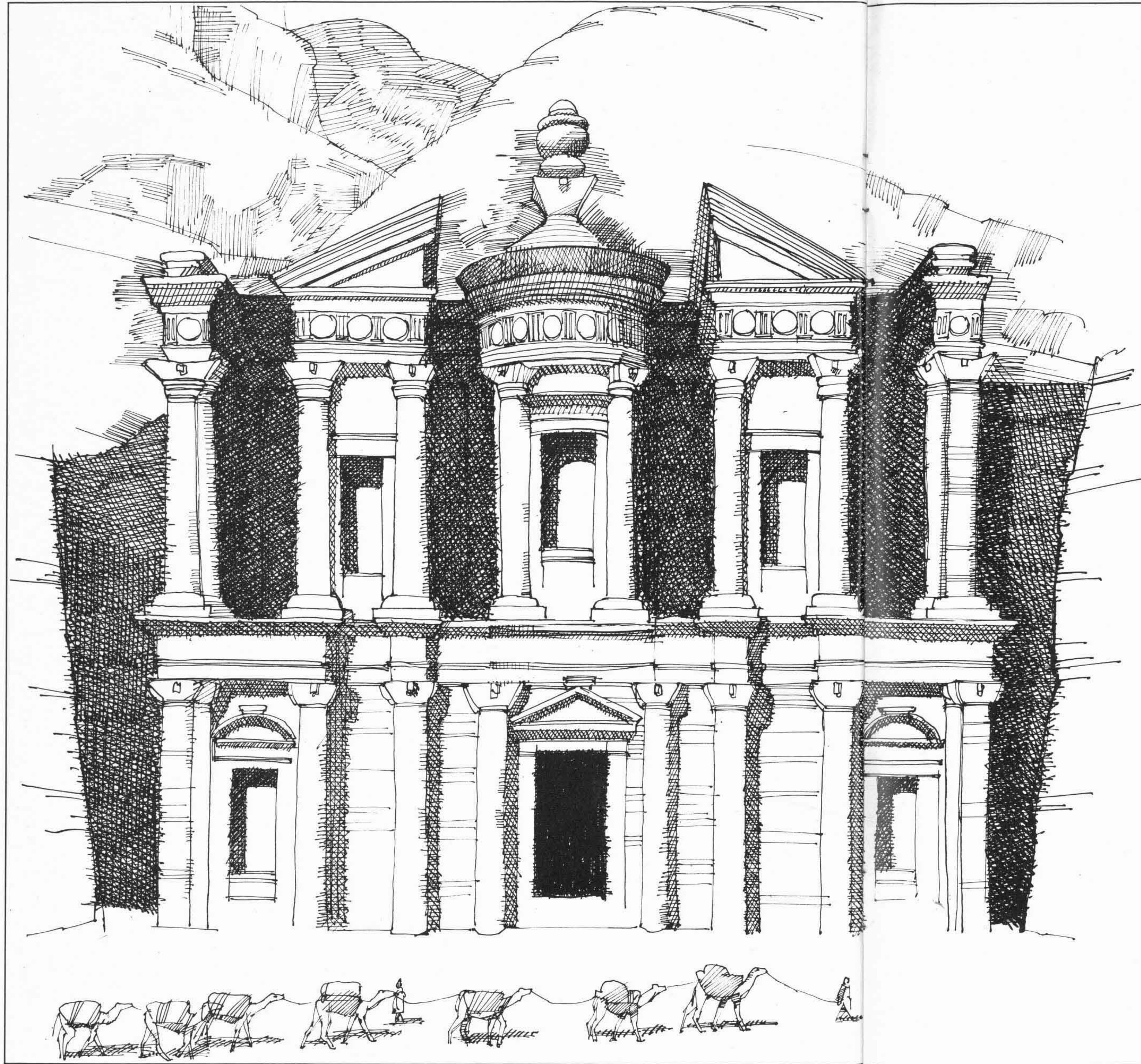
Charmingly illustrated popular romances produced in Iran and India, where lithography practically eclipsed printing after 1824, are collector's items today **(See illustrations 17, 19 and 20).** A number of very beautiful lithographed books were also produced in North Africa in the late 19th century, particularly in Fez **(See illustration 18).**



20

Today, of course, printing with movable type, rather than by the lithographic process, has taken over in most of the Middle East, and computerized typesetting is absorbing the energies and talents of typographers and graphic designers. Yet the new typographers are still grappling with the same problems that faced Granjon, Zakhir, Muteferrika and others: how to marry the beauty of calligraphy to the efficiency of printing, a process that, in the history of the world, ranks with the alphabet – and the computer – in importance and was a vital factor in the modernization of the Muslim world.

Paul Lunde, an Aramco World *staff writer, researched this special section at the Vatican Library, where, until moving to London, he was engaged in studying Arabic manuscripts.*



They paved the way for the future...

A KINGDOM OF TRADERS

WRITTEN BY PHILIP C. HAMMOND
ILLUSTRATED BY MICHAEL GRIMSDALE

Classical historians and archeologists have long overwhelmed us with the importance of Rome. Lately, though, they seem to have realized that the Romans, despite great achievements, were not alone in the ancient world. In the last 20 years, for example, the scholars have begun to pay attention to a people who made more than a passing impact upon the ancient world: the Nabateans.

A pre-Islamic Arab group, the Nabateans, or "Nabatu," made their first impact on the ancient world as Red Sea raiders, but then, defeated too often, became nomads who next appear herding their goats and sheep along the western coast of the Arabian Peninsula and moving ever northward toward less populated areas. By the early part of the fourth century B.C., they had reached areas previously occupied by a group known as Edomites, who, for reasons unknown, had themselves moved westward after several hundred years of sedentary occupation.

Gradually advancing into this territory – in today's Jordan – the tribal groups who made up the Nabatu found a land-locked site which offered security, pasturage and access to the major trade routes of the ancient Middle East – a paramount factor since the Nabatu, who had traversed the southern ends of those routes, had sensed the importance of controlling them. The site in which they settled, characterized by a towering mountain within a rock-girt valley, had been known in Edomite times as *Sela'* – "Rock" – but the Nabatu renamed it *Rekumu* when they settled in. Today it's called Petra.

By the late second century B.C. the Nabateans had consolidated themselves, politically and socially, into a kingdom – a hereditary monarchy, resembling a shaikhdom – under one Harith I (Aretas I), called *tyranos*. That ominous title soon changed, however; it became *basilaos*, the more common Greek equivalent for "king", and eventually *melek*, a Nabatean word reflecting the final realization of the people's own background and language, and the culture's own quasi-democratic characteristics. Strabo tells us, for instance, that the king served guests with his own hands and remained standing throughout the meal in order to make sure they were well fed, and the kingdom's coins were reminders that their king "loved his people," and was the "restorer and supporter" of the nation.

By the Roman Period, the Nabateans had already begun to make Rekumu – Petra – a place of beauty. By then they had constructed the main theater, with a capacity of more than 8,500 people, a paved main street with a colonnade, domed baths, and at least two magnificent temples to the local gods, along with a city now full of other public buildings and private homes.

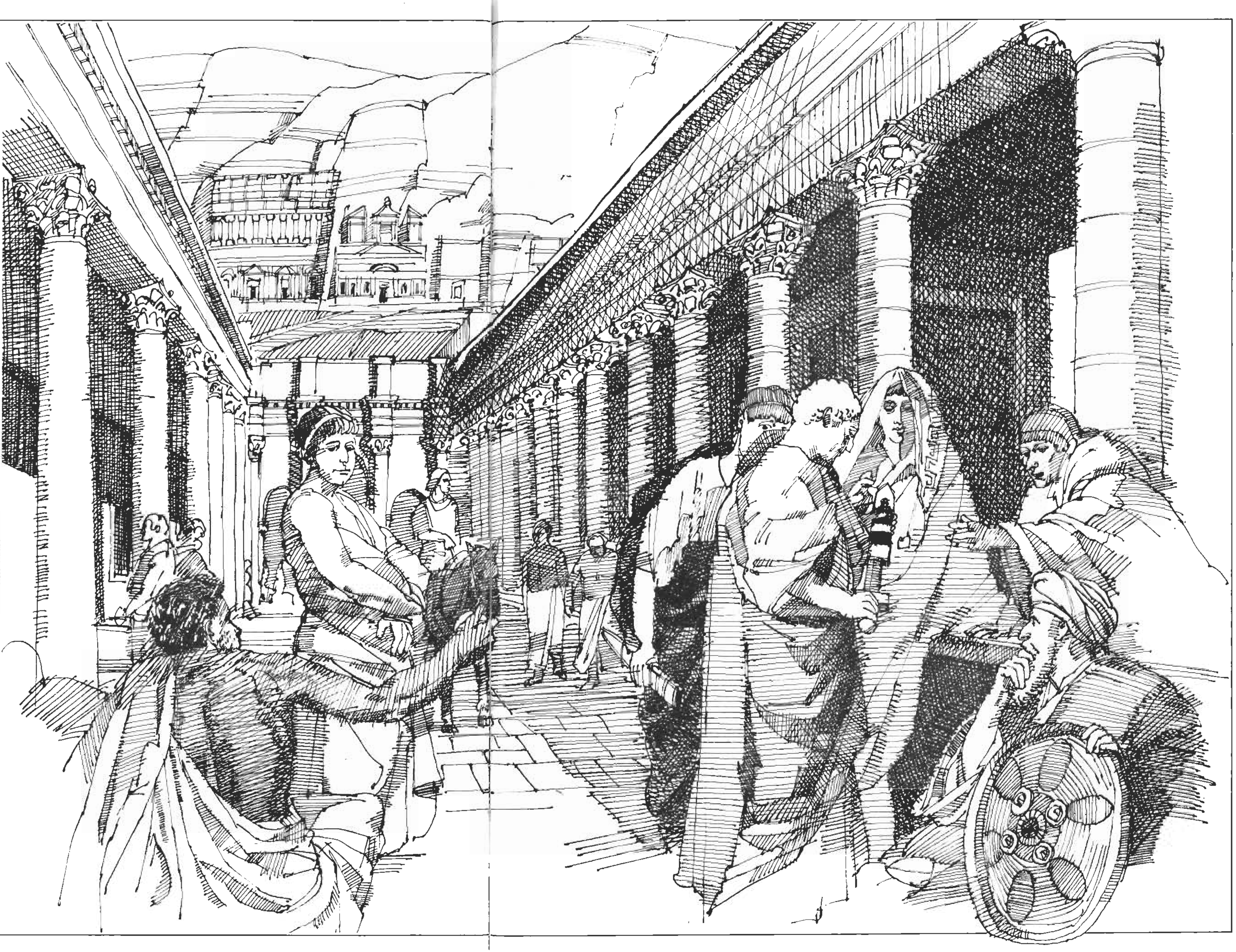
Decoration in Petra rivaled distant Pompeii, the columns and orders were taken from the best architectural authorities of the day, and the construction was virtually all of quarried stone. In addition, over 850 monumental tomb facades dotted the faces of every cliff, outcrop and mountain in the area. Some were simple, but some rose over 120 feet, with multiple stories and, often, with chambers which had required the removal of tons of stone.

The Nabatu had not neglected security either. The north and south ends of Petra's valley were sealed off by walls – with watch towers, guard posts, and other defensive installations – and the front door was defended by the vast, narrow cleft known today as the "Siq," a narrow passage meandering almost a mile between towering cliffs, and provided with a high dam to divert flood waters and preclude direct assault. Already, Roman legions had marched toward Petra, and though they had been bought off once and had been pulled back the second time, to face internal crises in Rome, the growth of the Nabatean kingdom almost guaranteed a third expedition and thus demanded "preventative" defense.

At the same time, the needs of the people had to be met, and from the skill of Nabatean engineers came masterpieces of hydraulic and agricultural development: aqueducts, runnels, catchment basins, diversion dams, reservoirs, pressure-piped water for the city, devices to retain moisture on the hillsides, terraces to increase production and intensive cultivation of the suburban plains.

From this strange urban center in the midst of nowhere, this once pastoral culture expanded until Petra became the hub of a civilization embracing over 1,000 sites scattered from Madain Salih, 500 miles from Jiddah, in today's Saudi Arabia, (See *Aramco World*, September-October 1965) to the upper edge of the Dead Sea, with brokers and agents equally scattered along the Arabian Gulf, Egypt, and on into Greece and Rome.

By the early first century the "city" controlled some 25 percent of the gross national product of Rome itself, with the goods of India, China, Persia and the Arabian Peninsula, most importantly frankincense and myrrh from the south-passing through Nabatean hands. Profiting from their days as wandering nomads, the Nabateans came to control this international trade by carrying their wares on their



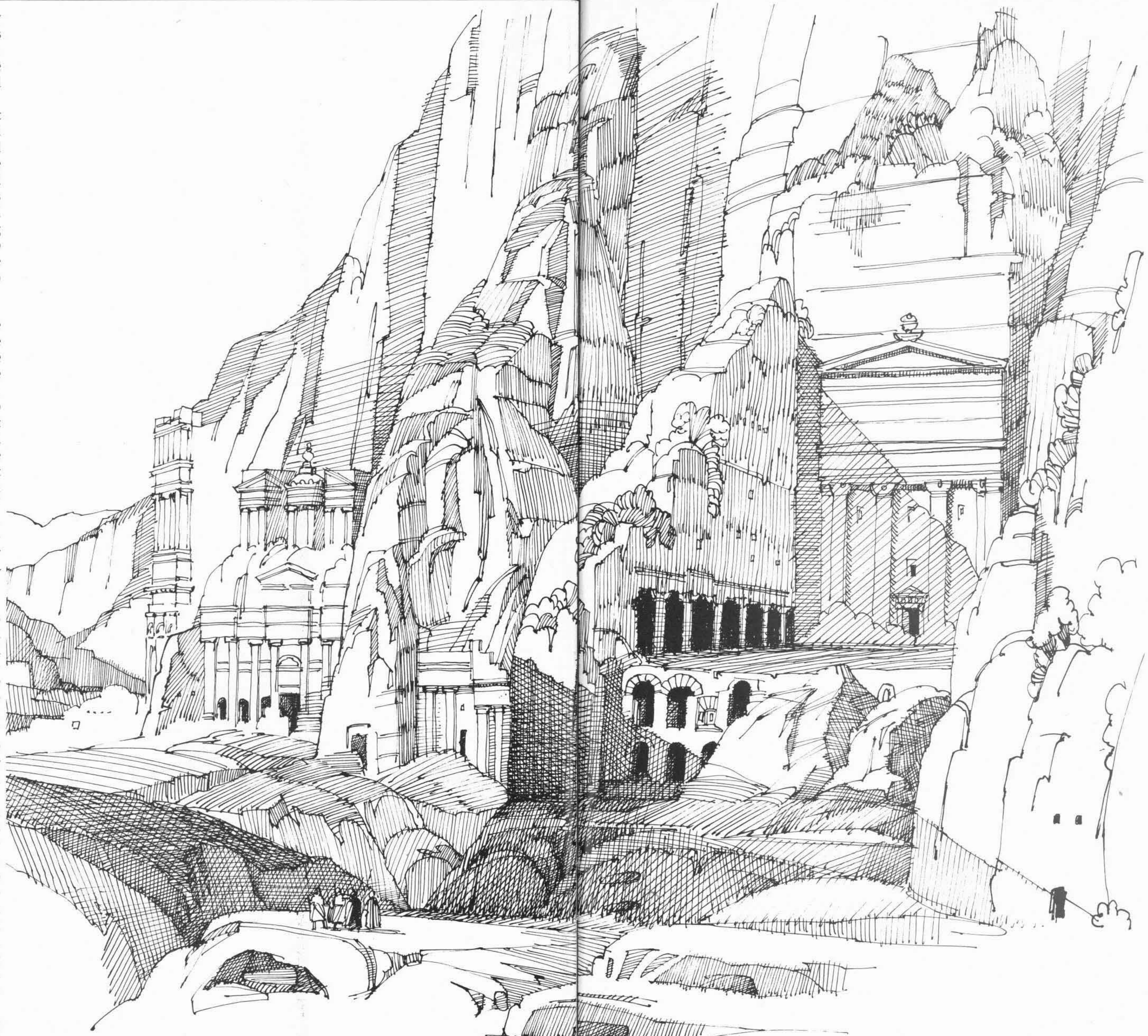
own caravans, along their *own* closely guarded routes, using their *own* rest stops and depots, and collecting their *own* taxes. Rarely before, if ever, had a single Middle Eastern kingdom so completely dominated mercantile endeavors so profitably.

It's no wonder, of course, that distant Rome, as well as such neighbors as Herod the Great, began to envy Nabatean control of the great north-south, east-west trade routes, nor that the Nabateans developed amazing political skills as well as business acumen. While every other major local kingdom of the Middle East was being absorbed by Rome, Nabatea alone seems to have survived – for over 170 years after the arrival of the general Pompey who came to "liberate" the Middle East.

Nabatean methods varied over the years. Earlier, as noted, Rome's first advance was thwarted by bribery; the legions were "bought" by Antipater of Idumea, the desert area of ancient southwest Palestine, whose wife was Nabatean, and who needed allies to strengthen his fight against the Hasmoneans in Jerusalem, his political rivals. Then later, when an investigative team was sent out to determine what part of greater Arabia to conquer first, it was led in circles for six months by the "scout" provided by the Nabatean king, Obodath. And when Antony kindly gave away Nabatean balsalm groves in the Dead Sea Valley to Cleopatra – Herod rented them back – the Nabateans refused to pay the rent.

On another occasion, Augustus (Caesar) decided upon the royal succession – and sent a crown – but the king had already ascended the throne without consultation. Even in "cooperation" with the Romans, the Nabateans seemed to come out ahead. During the Jewish War of A.D. 70 the Nabatean king Malichus sent "help" – to the Roman army. Unfortunately, the Nabatean troops were a bit too efficient for the Roman commander and he sent them back to Petra.

Mighty Rome, of course, was seldom balked for long and eventually the Romans struck at Nabatean through her commerce – the very lifeblood of the kingdom – by diverging trade routes in the south to Alexandria and trade routes in the north to Palmyra. Gradually, as a result, Nabatean power diminished – the last king even moved to Bosra in Syria – and in A.D. 106, the legions of Trajan marched through the Siq – apparently without resistance and apparently with the connivance of Nabatean nobles.



But the story did not end there. The acumen of the Nabateans, which had brought them to such pinnacles of progress, did not fade simply because of foreign invasion. As recent excavations at Petra have disclosed, the economic level of the Nabatu does not seem to have diminished after A.D. 106. Instead, new buildings were erected – once attributed to the "the Romans", but, in fact, strikingly similar to classical Nabatean decoration – and as late as the fourth century the old trade lines across Sinai and across the Red Sea were converging at Tell el-Shuqafiya in the northwestern Delta area of Egypt – on their way to Rome's transit center at Alexandria.

Less obvious, and now becoming more widely recognized, was the continuation of Nabatean influence in the arts and crafts. Again, recent excavations at Petra strongly refute change during the Byzantine period there – and the countless numbers of "Byzantine" structures seen throughout southern Syro-Palestine look very much like their earlier "Nabatean" counterparts. Here and there a cross was added to the vine foliage designs, once a symbol of the god of the Nabateans, but the Nabatean influence lingered on. Dams, reservoirs, and water systems of all sorts continued to be built as the Nabateans had always built them.

Pottery forms and decoration mirror the same perseverance as do other craft arts following the fall of Petra. And in Egypt, even Coptic art is said to owe a debt to Nabatean art – as business continued – as usual across Sinai and the Red Sea.

How many vestiges of art, engineering and architecture passed into early Islamic times, from the pre-Islamic Arab Nabateans, remains to be investigated. But whether direct contact can be determined is irrelevant, for around the budding Islamic culture, throughout all of southern Syro-Palestine and Egypt, craftsmen and artists were surrounded with the vestiges of the Nabatean influence. Even Arabic script echoes the increasingly ligatured letters of Nabatean inscriptions, as against the more pictographic scripts of the Thamudians and others of the peninsula. The Nabatu, in short, did more than build the "rose-red city;" they also established an astonishing network of trade routes, outwitted the Roman Empire and paved the way for advances in art, literature, architecture and hydraulics that would not come until Petra, and the civilization it represented, had sunk into the archives of history and the silence of the desert.

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THE CAMEL IN RETROSPECT

WRITTEN BY DANIEL DA CRUZ – WITH PAUL LUNDE ILLUSTRATED BY NEVILLE MARDELL

An enduring impact ... a host of stories

In a sense, the camel is passing into history – at least in Saudi Arabia. Though there are still herds to be seen, the era of the great camel caravans has passed, and throughout the Arabian Peninsula the effects, to those who notice, are evident: untended desert wells and abandoned caravan routes. Soon, hundreds of centuries of tradition will have vanished.

Today, to be sure, camels are still raised for food – milk and meat – and for racing, but rarely for transport; camels cannot compete with the cross-peninsula Boeings, fast freight trains and trailer trucks that, by 1980, were providing most of the transportation for Saudi Arabia's goods and passengers.

As a symbol of a vanishing world, however, the camel continues to intrigue the Western world – partly because the camel, when introduced in countries outside the Middle East, left an enduring impression and a host of stories. In Australia, for example, in 1860, camels were imported from Peshawar and Afghanistan in hopes that they could help Australians explore the arid outback of that then-unknown continent. They acquitted themselves so handsomely that by the end of the century 6,000 more had been shipped in from British India. And until very recently the odd descendants could still be seen, at sunset, drinking from waterholes in the outback.

Similarly, aficionados of America's frontier history have long been fascinated by the oft-told tale of the U.S. experiment with the camel.

In 1857, the United States Congress, seeking an efficient means of getting mail to the west coast through the arid country beyond the Rockies, appropriated $30,000 to buy 75 camels from the Arab world, the center of camel breeding and export.

They were an instant success. Not only did they thrive on the thorn bushes and straw that the desert and their new masters could provide in the way of food, but also, padding silently out of the alkali flats of the Southwest, unnerved numerous Plains Indians, whose horses needed no urging to vacate the premises at a gallop.

Furthermore, camels made the transition to the New World – commands in English instead of Arabic, hauling mail sacks instead of firewood – without noticeable mental anguish. As General Beale, commanding the Army's camel corps, reported, the camels were "the most docile, patient and easily managed creatures in the world, and infinitely more easily worked than the mule."

Generals, of course, have a somewhat different perspective from that of soldiers, so it's not surprising that Beale's mule skinners-turned-camel drivers didn't agree. They said that the camels stank, spat, kicked, bit and made nasty noises. On the other hand, as one unkindly soul pointed out, so did the mule skinners, and in any case, when it came to a plowing contest in Alabama, an Army camel beat its mule competition hooves down.

The camel's easy adaptation to life in America may be less surprising if you remember that the New World was its historical homeland. Zoologists surmise that in the eons before the ancestors of the American Indian migrated across the Bering Sea to the American continent, the camel's forebears migrated the other way – to Asia. Those who stayed behind became extinct, except for the South American cousins, which include the llama and the vicuna. And in Asia, at some point, the species that had migrated from America developed into two different types: the Bactrian or two-humped camel – a short-legged, heavily furred creature found today in Asia from China to the Black Sea – and the dromedary, or single-humped camel, which inhabits southwest Asia, the Arabian Peninsula and North Africa. The dromedary is the creature that has so fascinated the West and, when domesticated, contributed so importantly to the history of the Arab East.

No one is sure when the camel entered history; some estimates say it was about 3000 B.C. But in any case, funerary decorations in the pyramids show, the camel was known in Egypt before the Assyrian conquest of the seventh century B.C. (See *Aramco World*, May-June 1973), yet by that time the camel had already been established for 400 years in Syria and Palestine, a result of the Midianites' invasion in which they came "as grasshoppers . . . for both they and their camels were without number . . ." The Midianites vanished into history, but the camel remained and multiplied. Job, says the Bible, in one of its 31 references to camels, owned 6,000.

It was the Arabs, however, who came to realize, and develop, the full potential of the camel. Indeed, without the camel the entire history of the Arab world might have been quite different. Domestication of the camel enabled early Arabs to explore and master the deserts of the Middle East, develop and monopolize the ancient trade routes between southern Arabia and the Mediterranean, establish mercantile networks and centers in northern and central Arabia, and later, after the rise of Islam, to carry their faith to the borders of China, North Africa and France; because of the camel, Arab armies could move swiftly and unexpectedly across terrain thought impenetrable by distant foes. And though attacks were often made on horseback, once the camel saddle was developed to the point where riders could use lances effectively, camels became tactically important too.

The camel was also a vital element in the daily life and the culture of the Bedouin; it was his chief source of food, raw materials, transport and wealth. Until recent times the desert dweller drank the camel's milk, feasted on its meat, fashioned rope from its wool, made shields and water buckets from its skin, bound wooden saddles together with its sinews, burned its droppings as fuel, and even turned to it for medicines; according to the 11th-century *Manafi 'al-Hayawan* ("The Uses of Animals"), the camel's hump was a specific for dysentery, its marrow a cure for diphtheria, and its brain, when dried, a treatment for epilepsy.

The camel's chief role, nevertheless, was as a beast of burden because, as a pack animal, the camel was incomparable. Strong, fast and cheap, the camel could carry up to 1,000 pounds on a short haul – more than an elephant – and up to 600 pounds almost forever: 20 to 30 miles a day for weeks on end, often going without any water for three straight days and sustaining itself on nothing but thorns, leaves and other bitter desert plants.

In addition, the camel had a long working life and could traverse terrain that would – and did – kill mules and oxen. The camel, indeed, was so efficient that much of the Arab East, until recently, never needed to develop more than a rudimentary system of roads. The Arab world, in fact, *abandoned* the roads built by the Persians and Romans before the advent of Islam, as well as the chariots and ox-carts that the Persians and Romans had developed. Why? Because camel transport was 20 percent cheaper than ox-carts (See *Aramco World*, May-June 1973), its chief competitor.

Behind this astonishing catalog of virtues is an extraordinary example of adaptive biology. Nature has provided the camel with ideal equipment to survive and flourish in harsh, arid environments. The camel's sight and sense of smell, for example, are exceptionally acute: the oblique flaps over the nostrils can be opened or closed at will to detect distant odors or shut out blowing sand, and a double row of eyelashes helps protect its eyes from the sand.

Then there's its divided upper lip. Prehensile and extensile, it permits the camel to examine its food by touch before ingesting it – even if its usual diet makes this particular faculty seem unnecessarily delicate. And its broad feet are padded with a thick mass of fibrous tissue which permits silent, painless progress across flinty ground – as well as stability in soft sand.

More important, given the environment in which it evolved, is the camel's remarkable ability to go without water for extended periods – an adaptation which has given rise to countless myths and amusing theories.

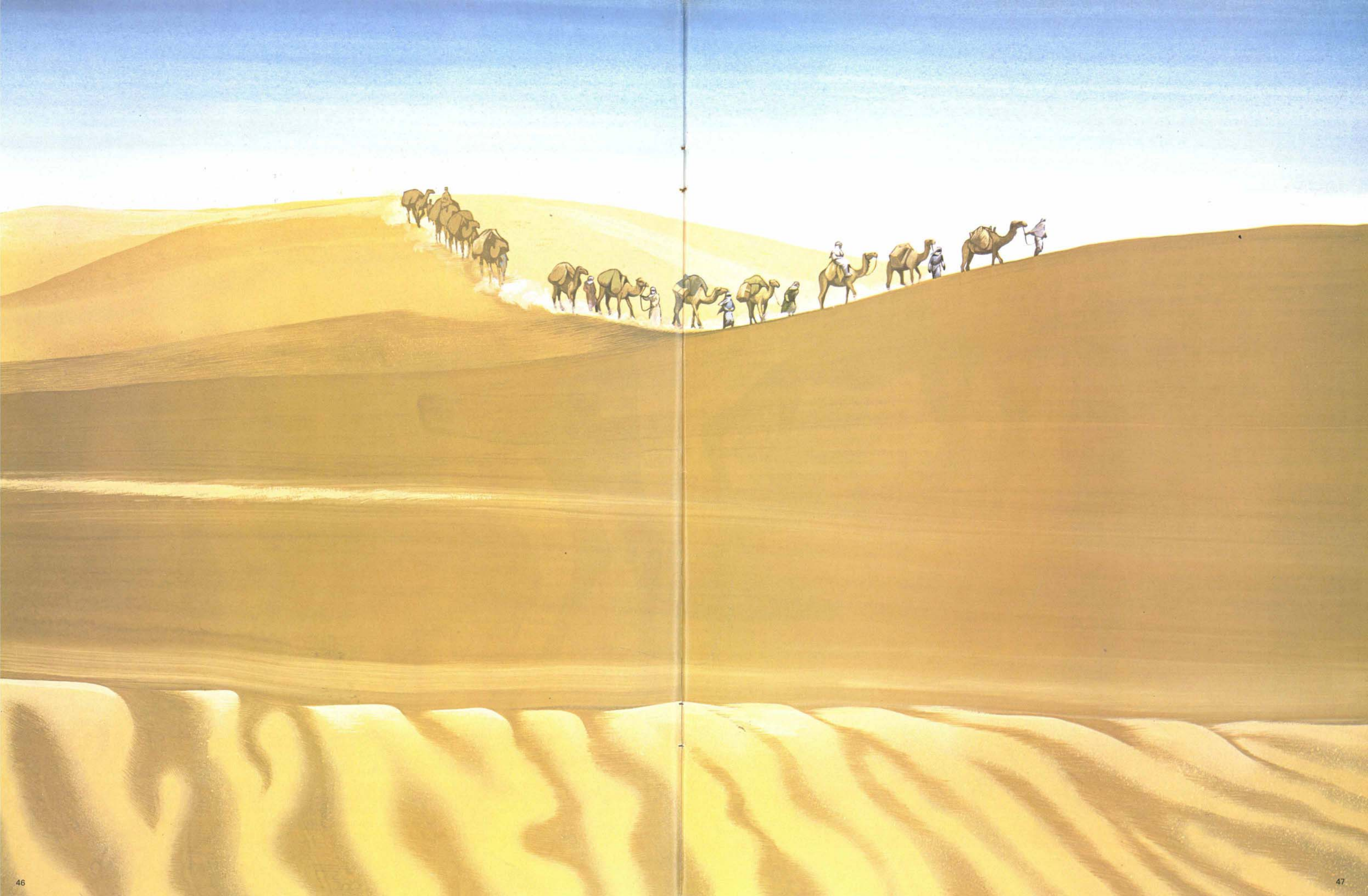
One, first put forward by Pliny the Elder, is that the camel has a built-in reservoir. As late as 1801, British zoologist George Shaw was insisting that "independent of the four stomachs . . . the camels have a fifth bag which serves them as a reservoir for water." Another is that the camel stores water in the hump. This theory was based on the fact that in the hot season the camel's hump gets progressively smaller. Scientists speculated that the unwatered camel produced water within its body by breaking down the fat in its hump. Since one pound of fully oxidized fat actually does yield 1.1 pounds of water, a camel with 100 pounds of fat in its hump might seem to be carrying 110 pounds – 13 gallons – of potential water.

Neither of those theories, so to speak, holds water. The camel has no special water-storing organ, and while there *are* pouches in the animal's rumen, or first stomach, it holds *less* water than that of the cow or other ruminants. As to the hump hypothesis, the fact is that the camel, while inhaling oxygen to oxidize the fat, *loses* more water by evaporation from the moist surfaces of its lungs than it gains from the fat.

Still, the camel *can* survive without water for long periods in even the most extreme conditions. Exceptional specimens can carry a rider 50 miles a day for five days before requiring water, and King 'Abd al-'Aziz, founder of Saudi Arabia, once related that a picked messenger, mounted on a racing camel, covered 530 miles in five and a half days. More remarkable was a dash of 800 miles in eight days, from Riyadh to Iran, made a number of years later: 100 roadless miles a day!

Witnesses have also observed camels in the Sahara going without water for a full winter while thriving on green plants having a high water content. Conversely, a thirsty camel on a hot summer's day has been observed to drink 27 gallons in 10 minutes. How can the one metabolic feature be reconciled with the other? Where does the water come from, and where does it go?

The answer, apparently, is an array of adaptations which, together, make the



camel's metabolism a wonder of the animal kingdom. Its diet, for instance, consists mainly of fibrous, spiny bushes, low in nutritional value, and its taste has become so specialized that except in extremity it refuses food with a high protein value. But the camel's digestive system is such that it can extract nutrition even from that meager diet; part of the urea that the camel's kidneys extract from its blood is passed back to the stomach where, in combination with partially digested cellulose from vegetable fibers, it gets reprocessed into new protein.

Those invaluable kidneys also enable the camel to tolerate brackish well water which in the desert is often contaminated by salts. The water is dangerous to men, but camels thrive on it. In coastal areas the camel can also eat dried fish or seaweed as salty as the sea itself. In both cases the kidneys remove the excess salt with great efficiency before returning most of the precious water to the bloodstream.

Neither of those mechanisms, however, explains fully the camel's ability to withstand great heat with low water requirements. Not until the 1950's did studies in North Africa, by biologist Knut Schmidt-Nielsen, show just how the camel pulls off a trick no other animal can duplicate.

Man, who shares the camel's environment but differs radically in his adjustment to it, serves as a convenient standard of comparison. When the temperature rises above 100 degrees Fahrenheit – and summer temperatures in the desert often exceed 120 degrees – man must either seek shelter or cool himself by water evaporation; that is, by sweating. On a hot day in the desert, a man can lose a quart of water an hour by sweating, and, within two hours, become savagely thirsty as a result. If he loses more than five percent of his body weight in moisture – that is, about a gallon – his physical condition rapidly deteriorates, his judgment becomes cloudy, his senses distorted. If he loses 10 percent, he becomes deaf, delirious and finally oblivious to pain. In cool surroundings, a man can survive for a time the loss of even 20 percent of his body weight in water – but not in the desert where the loss of no more than 12 percent will cause "explosive heat death." As the blood loses water, it becomes thicker and harder for the heart to pump to the skin where the air may dissipate the accumulating heat. In a vicious circle, the blood becomes hotter, thicker and still hotter until death ensues.

Not so for the camel, Professor Schmidt-Nielsen found. He kept a camel without water for eight days in heat so severe that a man would have had to drink hourly or risk death. While the animal lost 220 pounds – 22 percent of its weight – and was emaciated and listless, it was never in serious trouble. Offered water, it downed bucket after bucket and within an hour had regained its former appearance and condition. But how?

Tests showed that unlike man, whose blood volume and viscosity are strictly proportional to water loss, the thickness and quantity of the camel's blood remain almost constant. One young camel lost 44 quarts of water by sweating, yet its blood volume declined by less than a quart. Moisture had moved from the camel's body tissues to its blood; its tissues dehydrated while the blood volume stayed virtually unchanged.

Biologists decided this was a simple osmotic phenomenon, but why, they then asked, doesn't man's system and that of other mammals work the same way? The question remains unanswered.

Meanwhile, in a further adaptation, camels sweat less than humans. Man's temperature remains steady at about 98.6 degrees Fahrenheit, regardless of the temperature of his surroundings; this taxes a man's cooling system in desert sun temperature where exposed rocks heat up to 150 degrees. The camel's temperature, on the other hand, fluctuates widely. At night its body temperature falls as low as 93 degrees, and the heat of the morning merely serves to warm the animal up to "normal" – with no sweat. Not until a good part of the day has passed and the air temperature has climbed does a camel's body temperature reach about 105 degrees – when it begins to sweat freely. It therefore loses little water except during the day's hottest hours. And even then the camel functions more efficiently than its master, for its higher maximum body temperature decreases the *need* for cooling, which depends on the difference between body temperature and air temperature. Access to water drops the camel's 12-degree daily swing in body temperature to a mere four degrees, the normal winter variation for the species.

Camel hair, furthermore, is one of nature's better insulators. Even in the summer, when the camel sheds much of its wool – collected for the manufacture of tents and clothing – a layer several inches thick remains to protect the camel's back from the direct rays of the sun. Schmidt-Nielsen demonstrated how well this hair conditioning works by giving a camel a crew-cut. It produced 60 percent more sweat than its unshorn mate.

A final blessing for the camel is the location of its insulating fat: concentrated just below the hump, where it receives the full force of the sun's rays. In other animals, more even distribution of fat over the body surface slows down loss of heat from the body. The camel's fat, concentrated in the one spot where it is most needed, keeps heat *out;* elsewhere on the animal's body there is nearly no subcutaneous fat, and heat loss is not impeded.

It would seem then the West's fascination with the camel is at least partly justified. It *is* a remarkable creature, a fact reflected in the Arabic language; there are nearly 1,000 words in Arabic pertaining to camels.

On the other hand, nobody's perfect and the camel is no exception. Nature, it seems, had enough to do developing those lips and kidneys, insulating the hair and locating that layer of fat just where it should be. To expect a pleasant disposition as well would be a bit much. So the camel also turned out to be bad-tempered and, on occasion, dangerous.

Some of the stories about camels, no doubt, are exaggerated. But they're good stories just the same. Its surly, independent disposition, for example, led to one Arab proverb that goes, "The camelteer has his plans, and the camel has *his*."

Most observers also agree that in the mating season the camel can be positively dangerous. Its bite causes a ragged wound that commonly becomes infected, and an enraged camel can bite off the top of a man's head. Another story says that since a camel often carries a grudge, a man who has angered a camel is wise to throw a bundle of his clothes on the ground before trying to mount – so that the camel can tear and trample the clothes rather than the man.

If true, though, who can blame the camel? It lived in one of the world's harshest climes, carried loads that would have challenged the elephant, went without water for days on end – and then drank water that would poison a horse. Its master, meanwhile, drank its milk, fought battles from its back, made robes from its hair, bowstrings from its sinews and meat of its flesh. Surely, as one observer said, the camel was entitled to an occasional tantrum.

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