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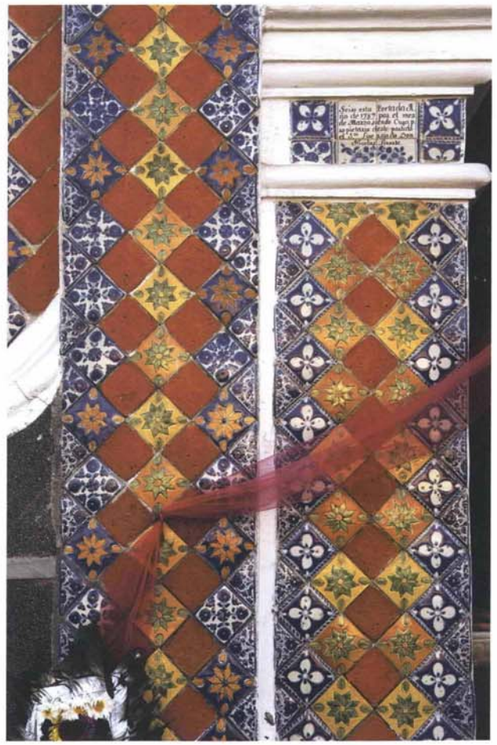

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EMPTY QUARTER

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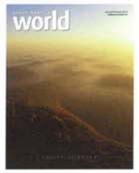
**Cover**




Sunrise sets a rare fog aglow near Shaybah, in Saudi Arabia's Empty Quarter. Though Arabs have regularly traveled well-established routes along the great desert's periphery for centuries, only Bertram Thomas, Harry St. John Philby and Wilfred Thesiger have left English-language accounts of their crossings. Photo by George Steinmetz.

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**Back Cover**

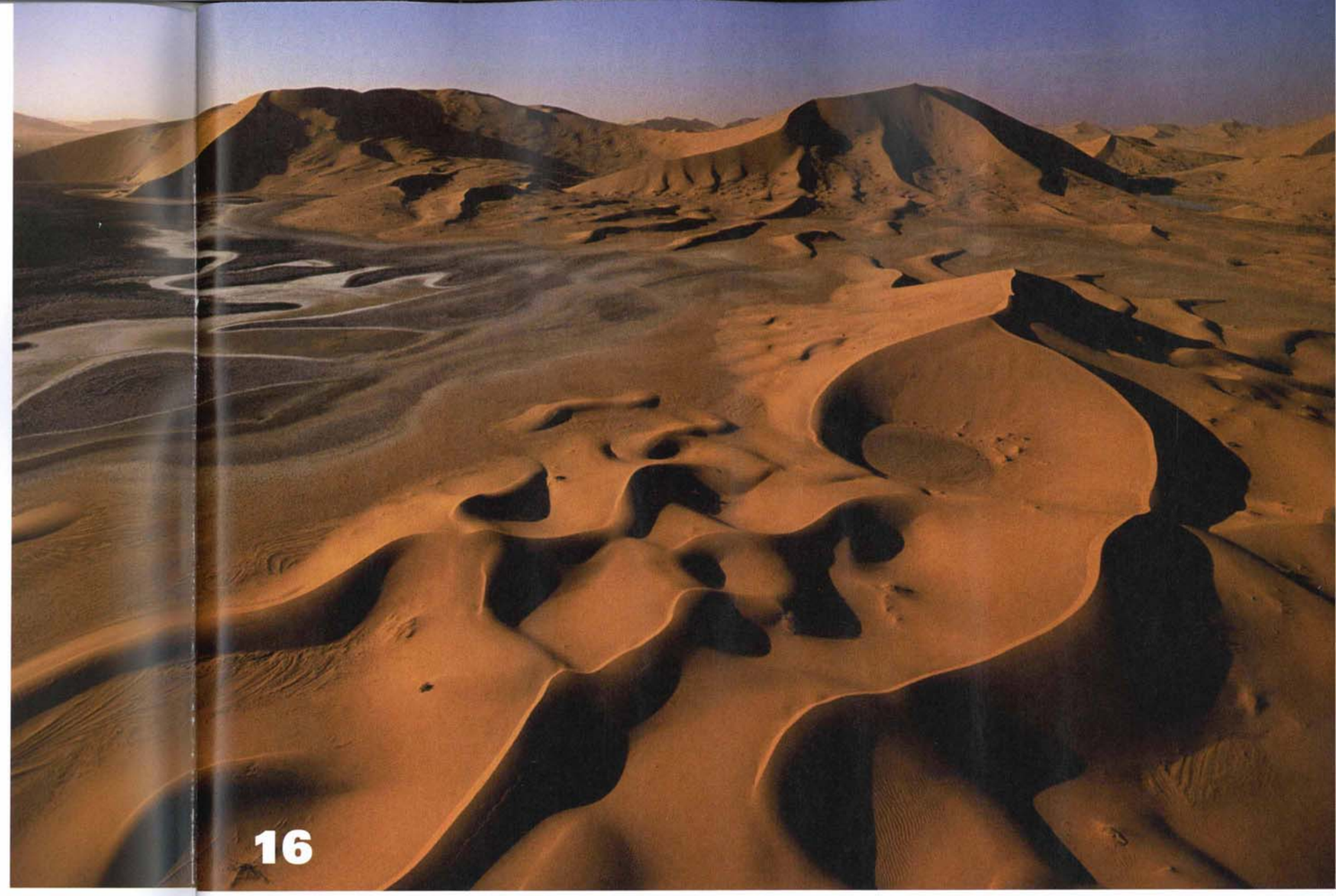
A swag of magenta tulle crosses the vibrant symmetry of *azulejo* (ceramic-tile) patterns on the façade of Santa María de Tonantzintla near Puebla, Mexico. The word *azulejo* came into Spanish from the classical Arabic *al-zujaj* ("glass"), and the use of tiles as an architectural feature likewise came to Mexico from once-Muslim Spain. Colonial builders' use of neo-Moorish tiles, stucco and carved wood distinguish Puebla's architecture. Photo by Kevin Bubriski.

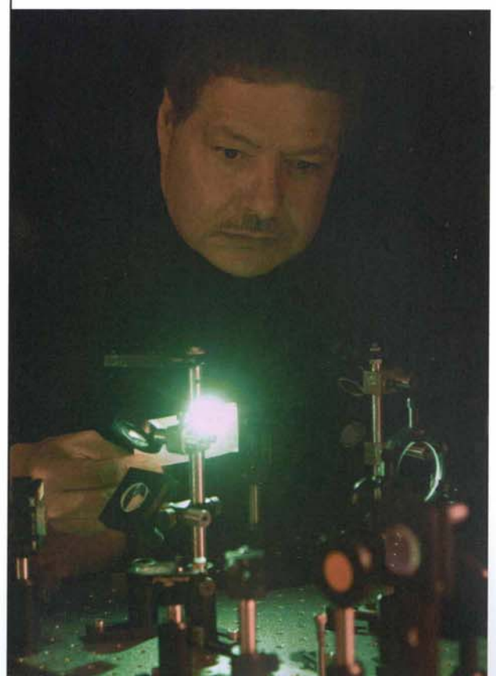
Saudi Aramco, the oil company born as an international enterprise more than seventy-five years ago, distributes *Saudi Aramco World* to increase cross-cultural understanding. The magazine's goal is to broaden knowledge of the cultures, history and geography of the Arab and Muslim worlds and their connections with the West. *Saudi Aramco World* is distributed without charge, upon request, to a limited number of interested readers.


## Threads on Canvas

Written by Tom Verde

In portraiture and other scenes, European painters of the Renaissance often included Oriental carpets to show high social standing. Among the painters, Hans Holbein the Younger was one of the most prolific, and today the term "Holbein carpet" has become a generic one among carpet historians, who use carpets in his and other artists' paintings—such as this one by Lorenzo Lotto—to understand weaving traditions that originated in the hills of western Anatolia, where they are still carried on today.



## 12
## The World's Fastest Scientist

Written by Andrew A. Sicree
Photographed by Nik Wheeler

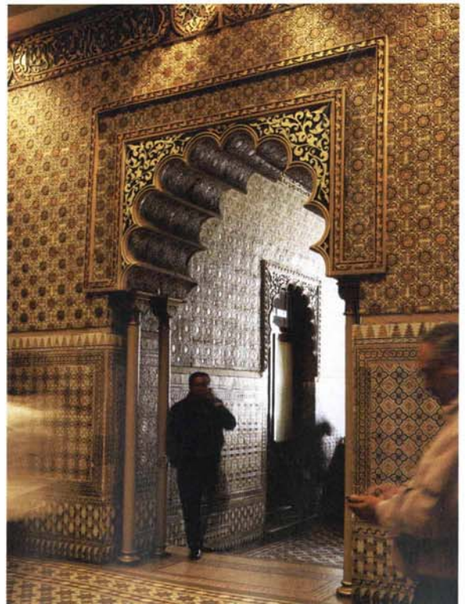
Born in the Nile Delta, Ahmed Zewail became the first scientist to record molecules while they were undergoing chemical reactions that take place in a few millions of a billionth of a second. This established the field of femtochemistry and earned him the 1999 Nobel Prize in Chemistry. In November, he was appointed one of the first three US Science Envoys to the Middle East.

LORENZO LOTTO, PORTRAIT OF A MARRIED COUPLE, CA.1524. HERMITAGE / ART RESOURCE (DETAIL)

## Empty Quarter

Written and photographed by George Steinmetz

Though it's no longer an uncharted sea of sand, crossing the vast, ridged, dune-dotted interior of the Arabian Peninsula's *Rub' al-Khali* ("the empty quarter") has proved daunting to all but the hardiest Bedouin and a handful of westerners (and, most recently, Saudi Aramco). A new book chronicles the author's explorations aboard a single-seat powered paraglider.



## 34
## Mexico's Colors of Three Cultures

Written by Louis Werner
Photographed by Kevin Bubriski

The city of Puebla and its surrounding towns boast dazzling colonial architecture whose design and vocabulary draws from Moorish, Spanish and indigenous traditions. Sometimes sublime, sometimes whimsical, these 300-year-old designs are among North America's most fascinating—and colorful.

# Threads on Canvas

Written by Tom Verde

**My mother taught me never to stare, but Georg Gisze started it.**

It was an April afternoon in Berlin's Gemäldegalerie—one of Europe's premier art museums—and the prominent German businessman and I were eyeballing each other across a distance of about two meters and nearly five centuries. Well, actually, it was a *portrait* of him by the famous German Renaissance painter Hans Holbein the Younger that I was eyeing.

Gisze was a member of the Hanseatic League, northern Europe's powerful trading cartel, and the painting, for which he sat in London sometime in 1532, was to be sent to his prospective fiancée back home in Danzig.

Evidence of Gisze's romantic intent is both subtle—the Venetian glass vase of pink carnations at his elbow that symbolized betrothal—and overt: The Latin inscription tacked to the wall attests that the painter has faithfully reproduced his subject's "features and figure" as they appear "in real life."

**Hans Holbein the Younger, "Portrait of Danzig Merchant Georg Gisze," 1532. The vase with flowers and the Oriental carpet are the only items in the painting not connected to Gisze's business. The flowers communicated romantic intent to his prospective fiancée; the carpet asserted status and gentlemanly refinement.**

Holbein's portrait also communicated the business end of Gisze's marriage proposal—that he was a respectable, prosperous member of Europe's emerging mercantile class—by depicting Gisze in his counting-house, surrounded by the practical tools of his trade: scales, pewter writing stand, leather-bound ledgers and contracts lining the wall. The one item in the painting that is not a business tool is the one that covers his work table: a brightly colored Oriental carpet.

Of all the status symbols in the painting, it was this carpet that intrigued me most, and it is what I had traveled to Berlin to see. Earlier that day, Jens Kröger, resident carpet expert at Berlin's Museum of Islamic Art, had told me that the German merchant had had Holbein include the costly, imported carpet as a way to "show off his wealth and good taste." Gisze might have been pleased to know that, in our own time, an entire class of Oriental carpets has come to be identified with the very one covering his desk—though he might perhaps have been disappointed that they were named not for him, but for the painter who rendered them in such vivid detail: Hans Holbein.

"[In Holbein's] elegant paintings there are carpets and table-covers copied with wonderful minuteness of detail and the most elaborate care, so much so, indeed, that ... the very stitches of the pattern may be counted."





Above and detail, left: **Hans Holbein the Younger, "The Ambassadors," 1533. The painting is notable not only because its carpet is the one that gave rise to the term "large-pattern Holbein," but also for its curious rendering, near its bottom center, of an anamorphic skull, discernible as such only when the painting is viewed at an acute angle.** Below, left: **A "large-pattern Holbein" with four central squares and,** below right, **an Anatolian design whose strapwork border makes it akin to the carpet in Holbein's portrait of Georg Gisze.**

So wrote Julius Lessing, one of a handful of German art historians who, during the late 19th century, began noticing and cataloguing the Oriental carpets that appeared in the paintings of such European masters as Holbein, Jan van Eyck, Lorenzo Lotto and Hans Memling. Lacking much information on the carpets themselves, these scholars came to rely on paintings from roughly the 14th through the 17th century—the heyday of the carpet trade between Europe and the Levant—for data on what was then the budding field of Oriental-carpet studies.

Linking the paintings of Hans Holbein to specific decorative weaving patterns, Italian Renaissance art expert and carpet collector Wilhelm von Bode, in his seminal 1902 study *Antique Rugs from the Near East*, coined the term "Holbein carpet" to label those carpets from western Anatolia that featured rows of knotted octagons (*guls*) and borders of interlacing, stylized Arabic script ("kufesque"). (See "A Beginner's Guide...," page 9.) Later, additional carpet classifications followed, named for other painters—Lottos, Memlings, Bellinis, Ghirlandaios and Crivellis, together with subcategories such as "small-pattern Holbeins" and "large-pattern Holbeins."

Beyond simply depicting the carpets (usually just enough of them to make clear the overall pattern), the paintings reveal important details of carpet manufacture, as well as intriguing facts about the significance of Oriental carpets in the spiritual, commercial and political lives of Europeans in the late medieval and early Renaissance eras.

"Oriental carpets represented wealth, power and holiness," said Walter Denny, professor of art history at the University of Massachusetts Amherst and a leading Oriental carpet expert. UMass Amherst is one of the only institutions (the other is Oxford University) to offer an advanced degree in carpet history. Remarkably, art and textile historians like Denny, as well as museum curators, private collectors and carpet dealers, continue to rely on paintings to inform their understanding of carpets from North Africa, the Levant and Turkey, particularly when it comes to dating them and determining their origin.

"No question," Denny assured me. "Paintings are still the bedrock on which the story of Oriental carpets is based."

What was that story? What advantages do 500-year-old paintings have over chemical analysis, electron microscopy, molecular forensics or any other modern tools available to textile historians these days? And is it possible to somehow trace a carpet, or a carpet style, from oil on canvas back to its source—wool on a loom?

Tracking down answers to these questions required an itinerary that might have been lifted

from a Cold War spy novel: Berlin to Istanbul, then across the Bosporus to remote mountain villages of western Anatolia that the medieval world travelers Ibn Battuta and Marco Polo may have passed through, and would likely still recognize.

My first, admittedly less exotic, stop was the Amherst home of professor Denny and what you might call his Oriental-carpet command center–his home office and library. Surrounded by thousands of catalogued volumes and images related to carpets, we talked about the field of carpet studies, the peak centuries of the carpet trade (14th through 16th), the freely acknowledged obscurity of the field and, in it, the enduring importance of paintings.

"We have inventories of carpets from the Medicis and others, but the inventories never tell you what the carpets actually looked like. The paintings do," said Denny.

He had a point. Venetian and Florentine inventories from the 16th century that mention Oriental carpets (*tapedi* or *tappeti*) often do so only vaguely. The most ornately patterned rug might be identified only by its dominant color, for example, *uno tappeto rosso* ("a red carpet") or *uno tappeto verde* ("a green carpet"). Geographical qualifiers are no more helpful: *tapedi cagiarini* (a Cairene carpet, from Egypt), *tapedi damaschini* (a carpet sold–but not necessarily made–in Damascus), *tapedei turcheschi* (Ottoman), *barbareschi* (North African) and *rhodioti* (imported via–or possibly made in–Rhodes). Worse, these toponyms often were used both interchangeably or as catchalls to describe *any* Oriental carpet. Even *tapedi* could mean either carpets or tapestries.

Then there is a raft of classifications that, to the layman's ear, sound oxymoronic: *tapedo da tavola* ("table carpet"), *tapedo serve il descho* ("carpet that goes on a desk"), *tapedo sul descho da scrivere* ("carpet on the writing desk," as in Holbein's portrait of Gisze), *tapetti da letto* ("bed carpets") and *tapetti da banco* ("bench carpets"). There were even subcategories of covers *for* carpets–a practicality when food, wine or other staining substances were being handed around the family's tapedo da tavola. (Accidents can happen. I certainly wouldn't have wanted to be the one to inform the notoriously short-tempered, axe-happy Henry VIII that one of his desk carpets, as noted in the royal household inventories, was "steyned with yncke.") In fact, the paintings and the

Below and detail, left: **Paris Bordone, "Fisherman Returning the Doge's Ring," 1534. It was around this time that painters began to show carpets beneath the feet (and thrones) of royalty. The one shown is similar to a star-Ushak carpet,** below, **from west-central Anatolia, dated to the late 16th century.**

records show that Oriental carpets were objects far too precious to leave lying around on the floor.

"Oriental carpets were extremely costly and associated with high social status," said Denny. "Walking on expensive, imported textiles was something only royalty did."

And saints. From the mid-13th to the mid-15th century, artists often painted carpets beneath the feet of Christian religious figures, most frequently Mary, Jesus and various saints. This iconographic use of carpets may have been inspired by carpet uses in the lands of their origins. The Qur'an (88:15-16) describes heaven as a garden, with "cushions set in rows, and rich carpets (all) spread out," while chapter 55, verse 76, lists "rich carpets of beauty" among the pleasures of paradise. The well-known use of carpets in mosques, in fact, inspired yet another Italian classification, referring to prayer rugs: *tapedi a moschetti* ("mosque carpets").

By the mid-16th century, Oriental carpets also began appearing in paintings beneath the feet of European kings and high officials. Court portraits of both Henry VIII and his heir, Edward VI, show them striking similar poses on, respectively, an eight-lobed medallion Ushak carpet and a small-pattern Holbein. Paris Bordone's 1534 "Fisherman Returning the Doge's Ring" shows the Venetian ruling council on a raised dais draped with a large "star-Ushak" carpet. More famously, Holbein's 1533 "The Ambassadors" shows the carpet after which "large-pattern Holbeins" were named.

Publicly, carpets were displayed draped off bridges, buildings and (in Venice) even gondolas on festival and feast days. Venetian

**Artist unknown, "The Somerset House Conference," 1604, which depicted treaty negotiations between Spanish and English delegates. They met at a table covered by an extraordinarily large carpet.**

TOP: GALLERIA DELL' ACCADEMIA, VENICE / BRIDGEMAN ART LIBRARY; CARPET: TEXTILE MUSEUM; LOWER: NATIONAL PORTRAIT GALLERY, LONDON



Senate secretary Marino Sanuto in his diary described a procession in the Piazza San Marco: *"[E]l palazo era tutto conzato la faza sopra la piaza verso el campaniel di tapezarie ... cosa belissima a veder."* ("The façade of the Doge's palace facing the bell tower of St. Mark was covered in carpets ... a most beautiful thing to behold.") A dozen years earlier, Italian artist Gentile Bellini–for whom "Bellini carpets" are named–had painted just such a scene.

Here again, the Muslim world may have provided precedent. The 15th- and early 16th-century Egyptian historian Ibn Iyas reported that the throne of Mamluk sultan Qansuh al-Ghawri stood upon a large carpet, and on state occasions part of his route through Cairo was strewn with carpets made of silk. Likewise, in the late 15th century, the Venetian traveler Giosafat Barbaro, on a mission to the court of Turkmen sultan Uzun Hasan, witnessed a public festival in Tabriz where freshly mown grass beneath royal pavilions was "covered [with] the most beautiful carpets ... of Cairo and Bursa."

As so often happens in the world of material culture, what is in vogue among the rich one day soon becomes the must-have of the middle class. So, from the latter part of the 16th century, possession and display of Oriental carpets became a way for upwardly mobile bankers, merchants and the like–Georg Gisze among them–to advertise their arrival at positions of social status. Thus, in a 1543 fresco by Moretto da Brescia, the rich and lovely daughters of the house of Martinengo strike rich and lovely poses on the family's prized Mamluk rugs, and in Lorenzo Lotto's

Below and detail, left: **Domenico di Bartolo, "Marriage of the Foundlings," ca. 1440. Note that carpets appear not only beneath the wedding party's feet, but also draped from the balcony above.** Lower: **Frans Floris, "Portrait of the Van Berchem Family," 1561, which shows use of a plain cover cloth to protect the table-carpet.**

TOP: OPESDALE DI SANTA MARIA DELLA SCALA / F. LENSINI / BRIDGEMAN ART LIBRARY; LOWER: THE YORCK PROJECT / WIKIMEDIA COMMONS

## *Woven Wealth*

Renaissance Europeans were hardly the first to covet the carpets of Central Asia and Anatolia. Mesopotamian clay tablets refer to trade in woolen textiles, while excavations in ancient Troy and Turkmenistan have uncovered loom weights, spindle whorls and shearing blades from the Bronze Age (3300–1200 BC). What began as a domestic craft long ago developed into a commercial enterprise, furnishing the homes of aristocrats and the tents of tribal chiefs. Assyrian princes and upper-crust Greeks and Romans admired the "broidered loveliness" of such textiles as Clytemnestra strew at her husband's feet in Aeschylus's sixth-century-BC drama *Agamemnon*. Similarly, in Xenophon's *Cryopaedia*, written in the fourth century BC, Cyrus the Great "bade ... attendants spread Median carpets" for him beneath a grove of palm trees, and Ptolemy Philadelphus's description of third-century-BC Alexandria refers to "long-haired carpets made of fine purple-dyed wool."

The world's oldest surviving knotted pile carpet, now in St. Petersburg, Russia, dates from these distant eras: the Pazyryk carpet from the fifth century BC. Well-preserved and technically advanced, it features a design of grazing deer and horsemen. It was discovered in Siberia in 1949, in the frozen grave of a Scythian prince. Scholars are divided over the Pazyryk's origins: While its knots are Turkish, its motif is Achaemenian, that is, Persian.

In Europe, returning Crusaders were probably among the first to import eastern carpets in large numbers. However, the craft was well-established in Al-Andalus (Islamic Spain), where the 12th-century Arab geographer and philosopher Al-Idrisi wrote that in Murcia "are made woolen carpets which cannot be imitated elsewhere," and the 13th-century Andalusian writer Al-Saqundi noted that the "celebrated" carpets of Murcia "are exported to all countries of East and West." When Eleanor of Castile—princess of Murcia's political rival to the north—traveled to England in 1255 to marry the future Edward I, she brought with her, as part of her dowry, tapestries and carpets with which she decorated her private chambers. It was around this time that depictions of Oriental carpets began to appear in European paintings.

## *Back to Nature*

After Şerife Atlıhan learned the craft of weaving in her hometown, she studied the science of Turkey's carpets with German chemist Harald Böhmer.

During the 1970's, Böhmer (then a visiting teacher at Istanbul's German High School) set out to discover the sources of the vegetable dyes used in antique carpets. By the 20th century, those dyes, which produced soft and harmonious colors, had been abandoned in favor of cheaper, synthetic dyes that either faded quickly or remained unnaturally bright. After a decade of detective work, he isolated the indigenous plants that had provided the colors of the carpets depicted in the Renaissance paintings: red from madder root, yellow from chamomile, brown from walnut pods, black from oak bark and acorn cups. (Blue came from indigo, imported to the region from India since Roman times.)

In 1981, Böhmer persuaded the Turkish government and Istanbul's School of Fine Arts (later the Faculty of Fine Arts of Marmara University, where he met Atlıhan) to support the reintroduction of vegetable-dyed carpets in Sülemanköy (and, later, in Örselli) under an initiative known as the Doğal Boya Araştırma ve Geliştirme Projesi (Natural Dye Research and Development Project)—DOBAG for short. Böhmer now serves as principal advisor, and the day-to-day operations are run by members of the co-ops—primarily women—who spin, dye and weave their wool into traditional carpets of extraordinary beauty and quality. Knot-count is critical, and a carpet with 90,000 to 110,000 knots per square meter, which takes about eight to nine weeks from shearing to selling, earns the weaver around $350. These highly desirable rugs are sold at the co-op headquarters in Ayvacık and through a handful of international DOBAG dealers, and have been shown in museums and galleries from London to San Francisco.

Right and detail, above: **Lorenzo Lotto, "Mystic Marriage of Saint Catherine," 1523, in which the artist turned back the edge of one of the patron's carpets to show the high quality of its knotting.**

1524 "Portrait of a Married Couple," the subjects appear proud of their handsome, prominently displayed Bellini table carpet. Likewise, Lotto's patron and landlord, Niccolo Bonghi, makes a cameo appearance in the artist's 1523 "Mystic Marriage of Saint Catherine": He appears standing beside a pair of what are presumably his Anatolian prayer rugs. (Here, Lotto killed two birds with one brush: Not only did he exchange the painting for a year's rent, he highlighted his patron's connoisseurship by turning back the edge of the carpet beside Bonghi's head to display the quality of its knotting.)

Another notable detail is the placement of a carpet on a window ledge during special occasions or, ostensibly, for airing out—the 16th-century equivalent of washing your Lexus in front of the neighbors. For those who could only afford to be king for a day, carpets were available for rent; for the truly budget-minded, there were (just like today) many imitations or knockoffs: Carpets from the Balkans, then part of the Ottoman Empire, and Spain, with its lingering Muslim culture and its craft traditions, were of reasonable quality, while those made in Italy, Flanders and England were notably less so. Throughout the period, by far the most coveted were those "of Turquey makinge" (as noted in Henry VIII's inventory), specifically those woven in the western Anatolian region.

Italy—the ports of Venice and Genoa in particular—was the conduit through which most of these rugs arrived in Europe, under trade arrangements that dated back to the high Middle Ages. Even the conquest of Christian Byzantine Constantinople by Mehmet II's army in 1453, and its renaming as Istanbul, didn't much interrupt the flow of carpets. Genoese merchants, under a new trade agreement with Mehmet, moved offshore to the Greek island of Chios while continuing to supply the Turkish carpet-weavers with a key ingredient for making their dyes colorfast: alum, mined in both central Italy and Italian-controlled centers within Turkey.

Yet the prominence of Oriental carpets in western paintings indicates more than a thriving, symbiotic mercantile relationship. The West's high regard for rugs "of Turquey makinge" literally illustrated a cultural affinity.

"Carpets were the one Islamic art form known as well in the West as in the East," Denny observed. "They were part of the material cultures of both worlds at the same time."

While Venice was a major intersection for these two cultures during the Renaissance, it was Germany, not Italy, that was next on my journey—specifically, Berlin, the birthplace of Oriental-carpet studies, with its famed Museum of Islamic Art. That prestigious institution remains home to one of the world's largest and finest collections of the so-called painter carpets, and the capital's leading picture gallery, the Gemäldegalerie, which features paintings in which the carpets appeared. Though housed separately, they afforded me an opportunity to view both paintings and textiles, if not side by side, at least in the same day.

The textile conservation room of Berlin's Museum of Islamic Art, like so much in this once famously divided city, is a legacy of the Cold War. When the Berlin Wall came down in 1989 and the museum's treasured collection—including separated halves of single carpets—was reunited under one roof in the Pergamon Museum, the conservation room remained behind in the former West Berlin because of the Pergamon's lack of space.

Conservator Annette Beselin doesn't mind the remoteness of her workspace in Dahlem, a few kilometers outside central Berlin. It allows her the peace and quiet to concentrate on her job of restoring antique carpets and textiles in a setting that looks like a cross between a crime lab and a sewing boutique. Microscopes and beakers of special cleansing chemicals compete for space with spools of thread, bolts of cloth and shelves of art books featuring images of the paintings Beselin relies on when deciphering the details of antique carpets.

"The paintings are important because they not only help us classify the different types of carpets, but also provide precise details about the carpets themselves," said Beselin. These details include a carpet's likely place of origin, based on its pattern, and, most importantly for someone in Beselin's line of work, its age—or, at least, a *terminus ante quem*.

"The *ante quem* date is the latest date something can have been created," Beselin explained. "For example, if I see a carpet in a painting and I know the painting is dated 1540, then I know that the carpet was made earlier than 1540." Even how much earlier it was made can be answered by a close examination of the paintings, Beselin told me.

"Painters like Holbein were very accurate," she said. "If you look closely at the carpets in the paintings, you can see details like worn edges or worn spots. This helps determine the age of the carpet in the painting, which tells you when that type of carpet was being made. I can then compare the carpet in the painting to other carpets and determine their age. It's like working out a puzzle."

> "THE PAINTINGS CAN GIVE YOU EXAMPLES OF CARPETS THAT HAVEN'T SURVIVED OR BEEN FOUND YET."

But what of carbon-14, I wondered. Wouldn't that standard scientific method for dating organic material (such as wool) solve the puzzle more efficiently?

"The carbon-14 method only gives you a date accurate within about 200 years. You can't get an exact date," Beselin told me. Beyond that, the paintings provide data no laboratory ever could: information on objects that don't exist.

"The paintings can give you examples of carpets that haven't survived or been found yet," said Beselin. "They can help to fill in gaps between different types of carpets that we know from museum collections, so they help to show design or motif developments at the time."

Employing a sort of reverse logic, scholars have even looked to carpets in paintings to learn about the artists themselves. Bode observed that the colors of Oriental carpets may have influenced the palettes of artists like Holbein, while, more recently, carpet expert Luca Emilio Brancati suggested that carpets depicted in unsigned paintings could help identify the mystery artists.

"Judging from the paintings, it would seem that every artist tends to paint a

Right: **Lorenzo Lotto, "Alms of St. Anthony," 1542 (detail).** Below: **Moretto da Brescia (Alessandro Bonvicino), "Daughters of the House of Martinengo, Brescia," 1543 (detail, fresco).** Below right: **Giovanni Mansueti, after 1494, (detail): Men and women drape carpets from their windows during a procession.**

ACCADEMIA CARRARA / ERICH LESSING / ART RESOURCE

TOP: SS GIOVANNI E PAULO / CAMERAPHOTO ARTE / ART RESOURCE; LOWER LEFT: ARCHIVO FOTOGRAFICO BRESCIANO / FOTOSTUDIO RAPUZZI; LOWER RIGHT: ACCADEMIA, VENICE / CAMERAPHOTO ARTE / ART RESOURCE

carpet always using the same method," Brancati wrote in a 1999 Italian exhibition catalogue. "[T]his could prove to be a useful attribution tool."

But be warned: Looking *too* closely at carpets in paintings has a psychological side effect, Beselin suggested—what you might call "carpetomyopia."

"When I look at this painting, all I see is the carpet," she said, flipping to a picture of Andrea Previtali's "Annunciation," which features, among quite a few other things, a beautiful, intricate, small-pattern Holbein carpet.

"You begin to notice carpets everywhere in paintings. It will happen to you too," she cautioned me with a smile.

She was right.

As I wandered through the Gemäldegalerie later that day, it seemed there were carpets in every painting. Some I had come to see specifically, like the one in Holbein's portrait of Gisze or the Cairene-patterned carpet in Georg Pencz's 1534 "Portrait of a Young Man." But throughout the gallery I noted dozens of others, draped across tables in Rembrandts, de Keysers and Valckerts, or at the feet of religious figures in Memlings.

As Beselin said, the artists did a remarkable job of capturing the subtle details of knotting, patterns and colors, and soon I wanted a look at the textiles that had inspired the paintings. That meant a visit to the Pergamon Museum. Though it's famed for its towering reconstructions of Babylon's Ishtar Gate and its namesake altar from ancient Pergamon (modern Bergama, Turkey), students of Islamic cultures know the Pergamon Museum of Islamic Art as the repository of some 500 Oriental carpets and carpet fragments, ranging in date from the 15th to the 19th centuries, woven in places from Andalusia to India. Much of the collection was donated by Bode, who rummaged through Italy's castles and churches in search of carpets during the early 20th century when they were, incredibly, being tossed away as rags. "In Italy, at that time, they practically lay in the streets and could be had for a song," he wrote in his memoirs.

> "YOU BEGIN TO NOTICE CARPETS EVERYWHERE IN PAINTINGS. IT WILL HAPPEN TO YOU, TOO," SHE SAID WITH A SMILE.

Thanks to Bode's keen eye, these "rags" now rest in climate-controlled cases and hang in hushed, windowless rooms under controlled lighting on the Pergamon's second floor, where Kröger walked me through the exhibition. If anyone in town could be considered Bode's successor, it is this self-effacing, avuncular scholar, though he'd likely decline the honor. Like many in his field, he pleads ignorance when it comes to reliable data on the history of Oriental carpets, and he attributes much of what is known to paintings.

"The weavers left no production records," he said. "All that we know we must learn from paintings and from the carpets themselves."

Strolling through the galleries, Kröger pointed to examples of large- and small-pattern Holbeins, Lottos, and others—carpets that Bode, with his vast knowledge of Renaissance art, matter-of-factly associated with various painters. With Kröger's help, even I began to recognize patterns and nearly identical carpets from Holbein's "The Ambassadors," Previtali's "Annunciation," Antonello da Messina's "St. Sebastian" and—almost knot-for-knot—Lotto's "Mystic Marriage."

Far left: **Hans Holbein the Younger, "Henry VIII," early 16th century, shows him standing on a carpet.** Right: **Hans Eworth (attributed), King Edward VI, 1547.**

LEFT: BELVOIR CASTLE / BRIDGEMAN ART LIBRARY; RIGHT: NATIONAL PORTRAIT GALLERY, LONDON



Above: **Niccolo di Buonaccorso, ca. 1380: The Marriage of the Virgin (detail), shows a design similar to, but simpler than this carpet fragment from Turkey,** left, **dated about 1400, which depicts a battle between a dragon and a phoenix.**

TOP LEFT: BILDARCHIV PREUSSISCHER KULTURBESITZ / ART RESOURCE; RIGHT: NATIONAL GALLERY, LONDON / ART RESOURCE

Meanwhile, this man of unduly modest claims managed to fill a good part of my notebook with carpet terms such as *guls* (octagonal patterns characteristic of Holbein carpets), "kufesque," "knucklebone" and "arms akimbo" border designs; Spanish vs. symmetrical vs. asymmetrical knotting, and how all these details, together with the paintings, can pinpoint a carpet's regional origin. Other design clues, such as coats-of-arms or monograms, point to custom manufacture for aristocratic European clients, he said, while textual evidence mentions mass-production centers whose output was exclusively for export to the West.

"There were made-to-order, and there were carpets sold by measurement. The

## *A Beginner's Guide to Carpet Patterns*

"Oriental carpets are all about field, pattern and borders," said Jens Kröger of Berlin's Museum of Islamic Art. The "field" is the dominant background color. The "pattern" is the repetitive, ordered arrangement of decorative images or symbols on the field. The "borders" are the decorative strips encasing both field and pattern.

Even more elemental is knotting. Flatweave carpets are made on the loom by passing the threads of the weft horizontally back and forth across the vertical threads of the warp. In contrast, the knotted-pile carpet is made by tying individual knots of yarn in any of several patterns around contiguous threads of warp and shearing off the excess yarn with a blade to create uniform length, which becomes the "pile."

Carpet patterns vary enormously from region to region and from century to century. Animal designs were popular during the Persian and Seljuk eras (11th–14th century). With the rise of the Ottomans, weavers from the 13th to the 20th century favored the geometric and vegetal designs that appear in the patterns seen in the paintings. The origins of these and many other patterns stretch back millennia.

"The designs in these [carpets] are in fact a visual language, an expression of cultural symbolism and myth," said Istanbul carpet dealer Şeref Özen. Indeed, as professor Şerife Atlıhan noted, red in Anatolian carpets represents blood, or life, and blue represents the sky, or heaven. Similarly, the so-called endless knot motifs in many Holbein carpets are believed to be an old, superstitious ward against the fixed gaze of the "evil eye."

The border patterns are also symbolic. The so-called kufesque mimics the Kufic style of Arabic calligraphy, which was "the official and visible sign of Islamic power," as scholar Irene A. Bierman put it, appearing on signs, coins and state factory weavings as far back as Umayyad times in the seventh and eighth centuries of our era. Thus the artistic, symbolic incorporation of Kufic script into carpets served as "a distinguishing mark of the newly revealed religion," according to Bierman, and it was meant "to distinguish the products of the Islamic lands from all others" while artfully reminding western clients of the power to their east.

The kufesque pattern consists of the Arabic word "Allah," in which the article *al-* ("the") is separated from *-lah* ("God") by decorative flourishes. (Hence it is "kufesque," and not actually Kufic.) In many Holbein carpets, this pattern is reduced to the simple representation of the two upright letters in a repeating sequence. Not all approved of its appearance on carpets, which might end up beneath the feet of their owners, and similar objections were leveled at the "Bellini" or "keyhole" carpets, which featured the arch characteristic of Islamic prayer rugs. The disappearance of these Bellinis from western paintings after 1560 may be more the result of Ottoman politics than changing European tastes, said carpet historian Walter Denny. Debates such as these, he added, are ongoing.

"We have to constantly re-evaluate the scholarship," he said. "Each new discovery of a carpet, or a carpet in a painting, shows us how we may have been under-dating or over-dating certain patterns or carpets."

Sometimes, such discoveries are as easy as falling off a log—and just as scientific.

In the company of professor Atlıhan, even I witnessed a minor, serendipitous field discovery. While indulging me in a tourist stop at the ruins of Pergamon, Atlıhan spotted a ram's-horn pattern along a crumbling stone cornice. Remarking on the similarity of the curving, symmetrical spirals of the rams' horns and the equally symmetrical elements of the "ram's-horn" and "arms-akimbo" patterns in Anatolian carpets, Atlıhan conjectured that the ancient Greek design may have influenced the weavers of the region, who themselves were likely of Greek descent.

workshops were kept very busy," said Kröger.

Perhaps the busiest were in western Anatolia, a region stretching from the Marmara Sea to the Mediterranean and from the lofty, lonely Taurus Mountains to the tattered Aegean coast. While the Ottoman-era court and commercial workshops are long gone, this region still produces some of the world's finest handmade carpets, woven with naturally dyed, homespun wool on looms that haven't changed much since the first Holbein carpets were created there six centuries ago. Would Anatolian village weavers recognize their ancestors' handiwork in the paintings, I wondered. Could I hold in my hand not some replica but a contemporary carpet that had centuries of tradition woven in its warp and weft, a product as captivating to modern eyes as it was to the Medici or to Renaissance artists? The answers to these and other such questions lay to the east, through the port of Istanbul, commercial gateway between Europe and Asia since the days of Homer.

**Weavers in Örselli, Turkey prepare pots of natural dye for wool skeins hung on the stone wall. Thanks to the DOBAG Project, carpet-weaving traditions here continue to resemble those that produced the carpets so much admired in Renaissance Europe.**

Compared to the fabled, frenetic Covered Bazaar, Istanbul's artsy, low-key Arasta Bazaar, in the shadow of the Blue Mosque, seems like a retirement home. Moustachioed rug merchants sit outside their shops sipping tea from tulip-shaped glasses and playing backgammon in between customers. Less cajoling than their brethren in the Covered Bazaar, these fellows employ a craftier gambit: an ingratiating cup of tea and a gentle, no-pressure invitation to examine the merchandise.

One of the city's top dealers keeps shop just west of the Arasta, in a store that looks more like a hip boutique than an Oriental rug business. Funky felt hats are a hallmark of Şeref Özen's Cocoon Galleries, but when it comes to carpets, his whimsy gives way to worldliness.

"I deal in very old, tribal material from Central Asia–Persian, Uzbek and Turkish weavings primarily–for clients who are collectors," he said, handing me an unduplicitous glass of tea across his desk. Urbane and sophisticated, with a better command of English than mine, Özen, with shoulder-length gray hair, denim shirt and basketball sneakers, looked more like a Los Angeles studio musician than one of Istanbul's most exclusive carpet dealers. Yet his reputation has less to do with his haberdasher than with his knowledge of carpet history.

"During the Renaissance, more carpets were made for export to Europe than for the local Turkish trade," he told me, echoing Kröger's observations. In contrast to their humble origins as domestic, tribal weavings, Özen said, the oversized Oriental carpets in European paintings were evidence of a consumer base that simply could not get enough.

"The European market was an Orientalist market, and Orientalists tend to overdo it," he remarked. "We don't put carpets on tables in the East; we put them on the ground to sit on."

And to pray on: Just as Bode exhumed treasured-but-forgotten Oriental carpets from European churches, scholars have since discovered hoards of prize carpets in medieval mosques throughout central and eastern Anatolia. I spent an afternoon inspecting many such finds in Istanbul's Museum of Turkish and Islamic Arts.

Arranged chronologically, the exhibits tell the story of Turkish carpet weaving–including sections devoted to the painter carpets–from its origins in the Bronze Age (3300–1200 BC) to the late 19th century. To wander from room to room is to follow, in effect, a dotted line across a map of Central Asia, where the local tradition of knotted, pile-carpet weaving was probably introduced by pastoral nomads who themselves adopted the craft from prehistoric villagers.

Modern villagers still weave carpets the same way in the western Anatolian highlands, where Ibn Battuta noted a thriving export trade in "sheep's wool carpets" and which Marco Polo credited as the source of the "finest and handsomest carpets in the world."

A few days later, following the dusty wake of these legendary travelers, I was bouncing along a dirt track to the village of Sülemanköy, near the market town of Ayvacık in western Turkey's Aegean Peninsula. At the wheel to my left was Şerife Atlıhan, professor of traditional textile art at Istanbul's Marmara University. A native of Fethiye, on the southern Aegean coast, Atlıhan–like countless generations of Turkish girls before her–learned at her mother's knee how to spin wool and weave. Unlike those countless generations, however, Atlıhan spun her domestic chore into an academic career, and she works now as an advisor to self-supporting cooperatives that make traditional carpets using homespun wool and natural vegetable dyes. (See "Back to Nature," page 6.) Her job is to liaison with the weavers–settled Yörük tribal nomads with whom she has close, long-standing relationships–and make sure the quality of the carpets remains consistent.

> THE ÖRSELLI WEAVERS HOVERED OVER THE PICTURES OF CARPETS IN PAINTINGS LIKE LADIES AT A CLASS REUNION.

"The weavers can choose whatever colors and patterns they want, as long as they are traditional Bergama types–Holbeins, Memlings, Ghirlandaios and so forth," said Atlıhan, whose first task upon arrival at the co-op is to inspect size, pattern spacing and knot counts–90,000 to 110,000 knots per square meter (8400–10,200 per sq ft), no more, no less.

This is not only to ensure authenticity, but also because modern customers–like their Renaissance-era predecessors–desire specific sizes, patterns and colors, said Atlıhan. Americans, for instance, like big carpets (no surprise), Scandinavians prefer moderation (again predictable), while Dubliners have an aversion to green (which I did *not* see coming).

The carpet patterns do not exist on paper, but only in the minds and collective memories of the weavers, who greeted Atlıhan in the shade of what amounts to Sülemanköy's town square–a flagstone terrace beside a public water trough, in the shadow of the mosque. Many of these women have never ventured far beyond Ayvacık, let alone wandered the galleries of a Renaissance art exhibition. Yet when I pulled out a book featuring images of Oriental carpets and the paintings in which they appeared, they hovered over the volume like ladies at a class reunion recognizing old friends in a yearbook.

**A selection of designs from the modern weavers of Örselli is laid out for display in a park.**

"Ah, Holbein, Holbein, Lotto," they chattered, pointing to carpets in various paintings, the patterns of which are as familiar to them as their own children, even though they had never heard of Hans Holbein, Lorenzo Lotto or any of the other artists whose works are inextricably linked to 500 years of Oriental carpet history. Casting a professional eye on a 16th-century Ushak medallion carpet pictured in my book, weaver Şerife Ergün shook her kerchief-covered head.

"Ugh, too difficult," she said. "This one would take a long time to make."

This is not to say that the carpets these talented women weave are casual approximations of the real things of a bygone era. They are indeed about as close to them as you are likely to find this side of an original Holbein, as I was delighted to discover the next day in the mountaintop village of Örselli, near Manisa.

A scattered collection of red-tile roofs on stone houses sloping into the hillside, Örselli is home to a co-op similar to the one in Sülemanköy. The remains of a Roman road run along the outskirts of the village, adding heft to Atlıhan's declaration that this region has been a center of textile trade and manufacture for centuries.

As co-op members organized their carpets for Atlıhan's inspection, my eye caught one that truly looked as if it could have been peeled from the surface of a painting. It had all the elements of a classic, small-pattern Holbein: the rich blend of blues and reds and a "kufesque" border encasing a pattern of knotted octagons. My guess wasn't far off: Consulting some art-history literature, I found a near match in an anonymous 15th-century Italian painting, attributed to the Lucchese school.

Later, I watched these women spin the wool gathered from their flocks, dye it in steaming pots and transform the balls of colored yarn into works of art on upright looms, each purposefully positioned by exterior doorways so as to catch as much daylight as possible. I wanted to ask them if they felt a connection with the past I'd just traced across three continents. Then it occurred to me that they were themselves the living answer to my question. Like the carpet resembling the one from the Lucchese painting, these women and their craft are both the present *and* the past–or as close to it as any of us is likely to get.

Georg Gisze was right. I was impressed. Very impressed, indeed.

Writer **Tom Verde** (writah@gmail.com) holds a master's degree in Islamic studies and Christian–Muslim relations from Hartford [Connecticut] Seminary, and is currently on the faculty of the Department of Ethics, Philosophy and Religion at King's Academy in Amman, Jordan.

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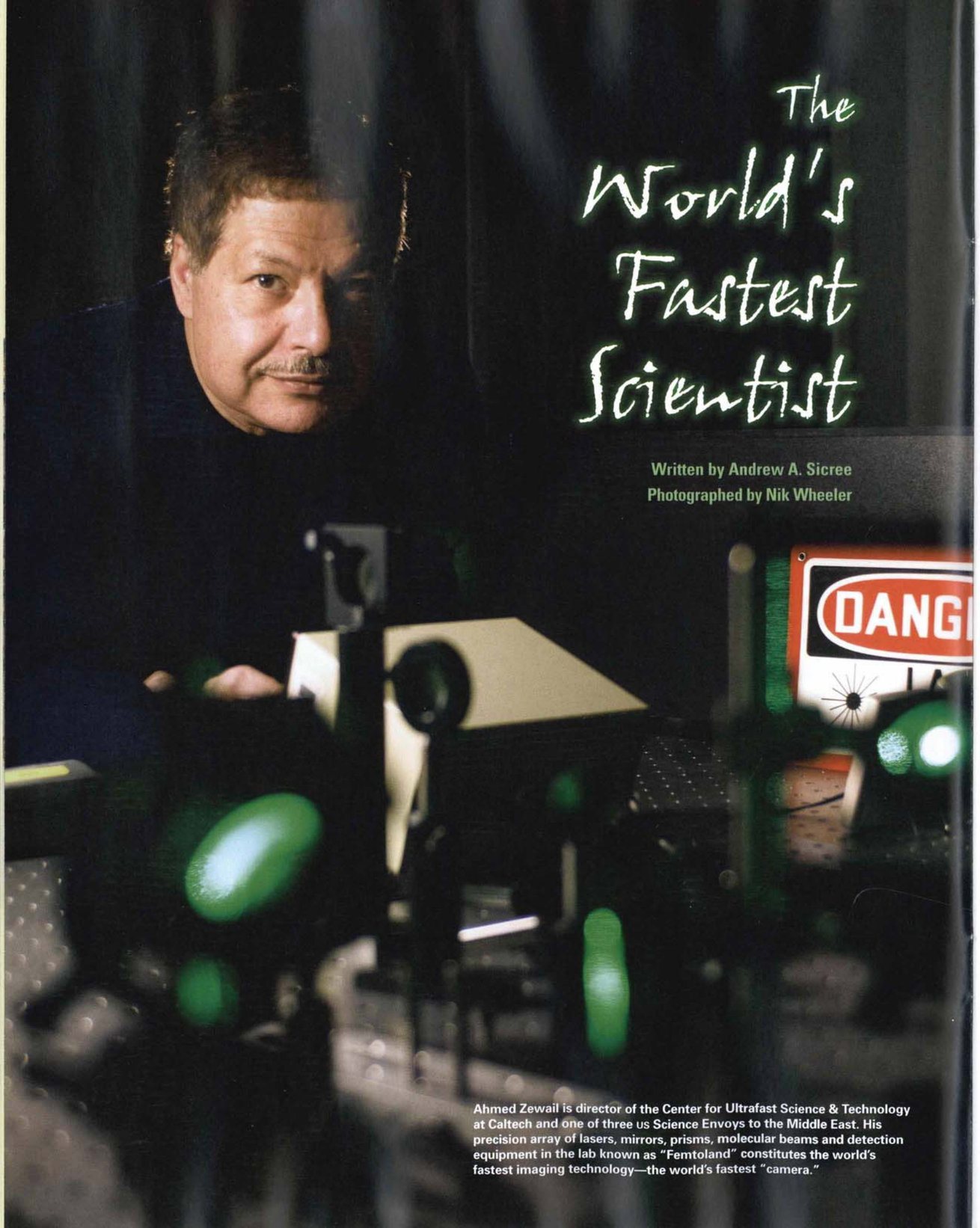
TOM VERDE (2)

# The World's Fastest Scientist

Written by Andrew A. Sicree
Photographed by Nik Wheeler




Ahmed Zewail is director of the Center for Ultrafast Science & Technology at Caltech and one of three US Science Envoys to the Middle East. His precision array of lasers, mirrors, prisms, molecular beams and detection equipment in the lab known as "Femtoland" constitutes the world's fastest imaging technology—the world's fastest "camera."

COURTESY NOBEL FOUNDATION / CALTECH

**Warm, late-afternoon sunlight streams through the window of a small room in the town of Desuq, in Egypt.** The year is 1960, and a teenager studiously attacks a long list of math and chemistry problems. While he works, the voice of renowned Egyptian virtuoso Umm Kulthum filters from his family's radio. When one song ends, he turns the dial, searching station after station to catch another of her hour-long songs of longing, loss and love. He's good at cracking the math problems, and—rather than distracting him—Umm Kulthum's music makes long hours of study a joy and a pleasure.

The boy's parents have high hopes for his future. They've hung a sign on his door that says "Dr. Ahmed." And Ahmed Hassan Zewail will grow up to more than fulfill his family's hopes and expectations: In 1999, as a professor at the California Institute of Technology (Caltech), he will be awarded the Nobel Prize for Chemistry, becoming the first Egyptian—and the first Arab—to win a Nobel in a scientific field. And in 2009, his career will come full circle when he is named one of the first three "scientist-diplomats" in the United States' new Science Envoy program, aimed at forging scientific and technological partnerships in the Muslim world to help meet global challenges in health, energy, the environment and water and resource management.

The love of science and math and the love of Egyptian culture are interwoven throughout Zewail's life history. His 1946 birthplace was Damanhur, which, as he enjoys pointing out, lies between Alexandria and Rosetta, two cities noted for their importance to the world's intellectual heritage. The famous Rosetta Stone, which Jean-François Champollion used to decode ancient Egyptian hieroglyphic and demotic texts, was unearthed in Rosetta in 1799. And the renowned Library of Alexandria was the greatest library of ancient times, containing hundreds of thousands of papyrus scrolls. For Zewail these cities were more than aspects of local history; they were an inspiration to scholarship.

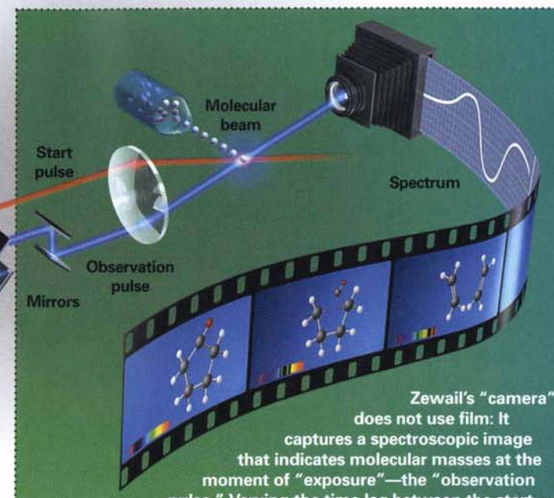
His growing-up in Desuq, a small town on the east bank of the Rosetta branch of the Nile, was a magical time for Zewail. He writes lovingly of his mother, Rawhia Dar, and father, Hassan Ahmed Zewail. His parents strongly supported his study of science and only lightly chastised him when he missed a point or two on a test at school. But in many ways, he notes in his autobiography, "we had a much bigger family—the people of Desuq. Families knew each other well, shared happy and difficult times, and valued interdependence...." At dawn, Zewail and the other children of Desuq rose and went to study at the nearby Sidi Ibrahim al-Desuqi mosque—a place of learning as well as prayer.

Fascinated by how science and technology worked, Zewail, then a student, once used an Arab coffee-roaster to heat wood chips in a test tube in an attempt to produce wood gas. To test whether his experiment was succeeding, he applied a lit match to the output of his apparatus and nearly set his bedroom aflame. On another occasion, the young Zewail decided to take his uncle's car out for a spin. He'd never had a driving lesson, but he'd learned how a car operated—in theory. His drive along the banks of the Nile barely avoided a potentially fatal plunge into the river. Decades later, in 1999, when he was awarded Egypt's highest state honor, he remembered his days growing up along the Nile. Egypt has never been far from his thoughts.

Zewail studied chemistry at the University of Alexandria and upon graduation in 1967 was appointed as a *moeid*, or demonstrator, at the university, teaching undergraduates while conducting his own graduate studies. One of the biggest decisions he made at this time was to leave Egypt in 1969 and go to America to pursue a Ph.D. at the University of Pennsylvania.

America presented Zewail with cultural and language challenges, but did not dim his vibrant optimism. Earning his Ph.D. in chemistry in 1974, he moved west to the University of California at Berkeley and then, in 1976, joined the faculty at Caltech, arriving with a raft of published scholarly papers in chemistry and physics to his credit.

At Caltech, Zewail proposed investigating what physicists and chemists call coherence; he contemplated experiments to study this phenomenon in single molecules as well as among billions of them.




**Zewail's "camera" does not use film: It captures a spectroscopic image that indicates molecular masses at the moment of "exposure"—the "observation pulse." Varying the time lag between the start pulse and the observation pulse is accomplished by moving mirrors by a few microns (thousandths of a millimeter) to create the time-sequence imagery that shows the stages of chemical reactions over femtosecond spans of time.**

## What is a Femtosecond?

A femtosecond is an excruciatingly short period of time. One femtosecond is one millionth of one billionth of a second. That fraction is written $10^{-15}$ in scientific notation, and the word comes from the Swedish word *femton*, "fifteen." One femtosecond is as much smaller than one second as the thickness of a human hair is smaller than the distance to the Moon. If you moved at the speed of light for one femtosecond, you'd only travel 30 micrometers, or about 0.0012 inches: Femtoseconds are so short that light couldn't get even a third of the way across a human hair in one femtosecond.

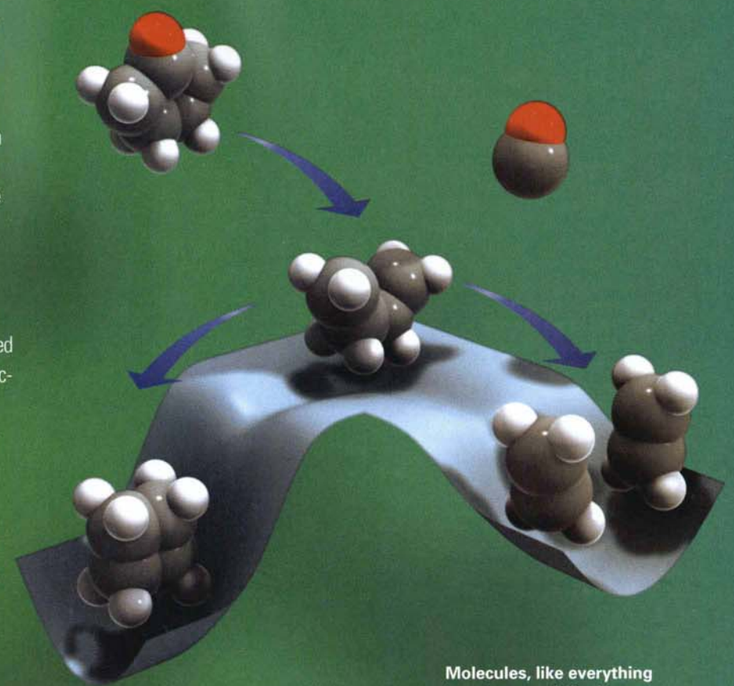
The fastest chemical reactions—such as the twisting of a molecule of retinal in your eye that allows you to perceive light—take about 200 femtoseconds to occur. To observe molecular transformations at high definition requires two laser pulses about 10 femtoseconds apart—and adjusting that time gap by making tiny changes in the positions of the mirrors shown in the diagram above allows scientists to visualize every stage of the transformation.

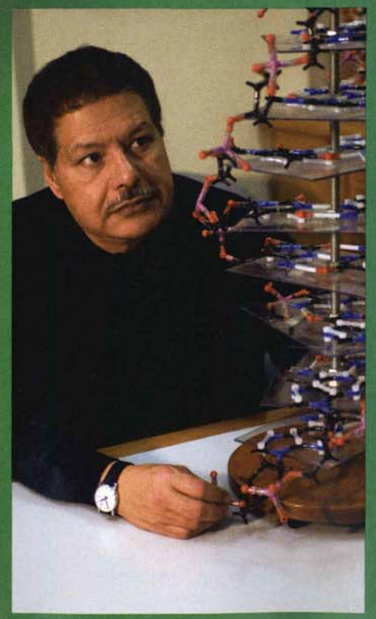
# Zewail and Femtochemistry

Chemical bonds are the glue that holds atoms together—whether the atoms make up a crystal, a leaf or your hand. If we could see bonds forming or bonds breaking, we'd have a much better understanding of how chemical reactions occur. Chemists know, for example, that when they burn charcoal, oxygen atoms bond with carbon atoms to form carbon dioxide ($CO_2$). They know what the starting materials are and what the end product is, but actually watching the reaction occur was impossible—before Zewail.

To study chemical bonds, you need to be fast. Bonds break and form so very quickly that you need an extremely fast "camera" to take stop-action pictures of two atoms approaching each other and forming a chemical bond. This is what Zewail figured out how to do: use a laser "camera" fast enough to take stop-action "pictures" of atoms as they formed or broke bonds. Zewail needed to set up a very precise molecular beam: a stream of molecules shooting out of a small nozzle at supersonic speeds. Different stages of chemical reactions that occur within the molecular beam will be found at different distances from the nozzle as the molecules jet away. The high speed of the molecular beam serves to spread the reaction out in space. Reactions in progress can then be "photographed" using a femtosecond laser aimed across the path of the beam, as in the diagram on page 13.

To do this, Zewail needed a laser capable of emitting ultra-short femtosecond pulses of laser light. Zewail's research group at Caltech was among the first to acquire such a laser, and he and colleague Dick Bernstein coined the word "femtochemistry" to describe the field of chemistry that studies the making and breaking of chemical bonds. Scientists at Caltech and elsewhere have been using femtochemical techniques to study biological systems, such as how oxygen binds to hemoglobin in the blood or how retinal in the eye changes its shape to signal a protein called opsin to trigger excitation of the optical nerve and thus vision. Zewail predicts that femtochemical techniques may eventually allow us to do "laser-selective chemistry," in which we use laser beams to manipulate bonds to create entirely new molecules.





**Molecules, like everything in nature, seek the lowest possible energy state. The cyclobutane molecule,** above, top left, **comprises four bonded carbon atoms. (Each carries two hydrogen atoms.) Zewail's Nobel Prize-winning breakthrough showed that when excited by a laser pulse for a few femtoseconds, the molecule goes through a two-stage transition,** center, **in which two of the four carbon atoms break apart, while the other two remain bonded. From this transition state, which lasts a few hundred femtoseconds, the reaction's second step goes one of two ways: Either the second carbon bond breaks, producing two ethylene molecules,** right, **or the first carbon bond re-forms, which drops the molecule to its lowest energy state,** lower left. **By showing the properties of the transition state—by opening chemical transition states to observation and thus prediction and perhaps manipulation—Zewail created "femtochemistry."** Left: **Zewail's current research in the folding (and misfolding) of proteins has potential effects in disease treatment and prevention.**

DIAGRAM: COURTESY NOBEL FOUNDATION / CALTECH; OPPOSITE: COURTESY AMERICAN UNIVERSITY IN CAIRO PRESS



The difference between coherent and incoherent molecular vibration is akin to the difference between a marching band and a random crowd of people walking down the sidewalk: The feet of people in a crowd move in a random, incoherent manner; a marching band displays coherence when each musician moves his or her feet up and down in unison, in step with the music. If you know someone is in the marching band, then you can tell how that person's feet are moving by watching the whole band—you don't have to pick out the individual. Similarly, on the atomic level, you can study the vibrations of a molecule if it is part of a large group of coherently vibrating molecules. And if you know how molecules vibrate, you can begin to predict how they will react with each other—which is the essence of the science of chemistry.

Some of his chemistry colleagues argued that Zewail's experiments with coherence would never succeed. But he pushed ahead to do experiments that others thought theoretically impossible, perhaps because his youthful experience crashing his uncle's car had taught him the difference between theory and practice. Zewail's belief in coherence was justified in 1980 when he and his fellow researchers demonstrated coherent vibrations in isolated molecules of the hydrocarbon anthracene. This demonstrated the reality of coherence within molecules and put chemists on the road to using coherence to predict chemical behavior; it was his first major breakthrough.

Zewail wanted to see further. Although he'd never used a laser before coming to America, Zewail recognized that if you had a laser that produced very short pulses of light, you could use it to watch chemical reactions actually happening. To work, though, the pulses had to be *extremely* short—only a few femtoseconds in duration (see "What is a Femtosecond?" page 13), a billion times shorter than had been achieved until then. At Bell Labs, Erich Ippen and Charles Shank developed the first femtosecond laser and Zewail integrated it into his apparatus.

The first chemical reaction that Zewail and his colleagues studied with the femtosecond laser apparatus was the breaking of a chemical bond. In late 1986, they aimed their femtosecond laser at the simple molecule iodine cyanide (ICN) and watched as the bond between the iodine atom and the carbon atom of the cyanide group stretched and then snapped. The bond broke "little by little, the first time such a thing had ever been witnessed in real time," Zewail wrote. This was his second major scientific breakthrough.

The impact of Zewail's research was acknowledged when he was awarded a solo Nobel Prize. The Swedish Academy of Sciences noted that Zewail "brought about a revolution in chemistry" by enabling us to "see the movements of individual atoms." The Nobel Prize committee recognized that Zewail's work allows us to "understand and predict important [chemical] reactions." Today, Zewail is the Linus Pauling Professor of Chemistry, professor of physics and director of the National Science Foundation Laboratory for Molecular Sciences at Caltech. He is widely respected as the founder of the field of femtochemistry and continues to build on the work that won him the Nobel Prize. Currently, he and his colleagues are developing techniques for four-dimensional (that is, the familiar three dimensions of space plus time), ultra-fast electron microscopy and diffraction. Among many other applications, these techniques will be used to study the folding of proteins and their misfolding, which appears to be involved in a number of diseases such as Alzheimer's and in some forms of obesity.


Seeing beyond the walls of his laboratory, Zewail frequently gives public lectures stressing the importance of fundamental scientific research. Although declining numbers of students choose to major in the sciences, he is optimistic that this decades-old trend can be reversed. With one foot in America and one in Egypt, he is perhaps uniquely situated to understand the difficulties faced by scientists in both countries. "I am an optimist," he says, and at every opportunity he speaks about the importance of the promotion of science and technology in developing countries. "Young scientists," he says, "shouldn't have to leave Egypt to dream big and to engage in frontier science and technological advancements." In Egypt, he has promoted the building of a new university of science and technology on the outskirts of Cairo. This new institution, he hopes, will grow to become Egypt's own Caltech.

One of the remarkable aspects of Zewail's autobiography, *Voyage Through Time*, is that it is replete with the names of hundreds of friends and acquaintances, ranging from Umm Ibrahim, the street vendor who sold him falafel sandwiches during his school days, to President Hosni Mubarak of Egypt. Over the years, he has worked with more than 300 scientists, graduate students, postdocs and other researchers—about 10 percent of them fellow Arabs—from around the globe. That collaboration will only grow with Zewail's appointment as a Science Envoy, announced by Secretary of State Hillary Clinton in Morocco November 3, which followed his appointment earlier in 2009 to President Obama's Council of Advisors on Science and Technology. The Caltech professor called the assignment as a scientist-diplomat "a great honor," and added that, after years of researching the dynamics of chemical bonds, "I look forward to helping forge new bonds among nations."

Ahmed Zewail now lives and works half a world away from his Egyptian birthplace. He is both Egyptian and American. But the heat of the Egyptian sun still warms his personality and his heart is still brightened by the music of Umm Kulthum. In his office at Caltech, he still listens to CD recordings of her voice as he works on a new set of problems in science—and in the world.

Geochemist, mineralogist and science writer **Andrew A. Sicree** (sicree@verizon.net) teaches university geosciences and conducts research for mining, oil and gas industries. He lives and works near State College in central Pennsylvania.

**Nik Wheeler** (www.nikwheeler.com) first worked for *Aramco World* and *Saudi Aramco World* in the 1970's, illustrating some 20 articles as well as special issues on Central Asia, China and the Silk Roads. His most recent book, *The Most Beautiful Villages and Towns of the Southwest*, is published by Thames and Hudson. He lives in Santa Barbara, California.

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Umm Kulthum: N/D 01
Jean-François Champollion: March 61
Library of Alexandria: M/A 94

**Voyage Through Time: Walks of Life to the Nobel Prize.** Ahmed Zewail. 2004, American University in Cairo Press, 978-977-424-843-6, $19.95 pb.

# EMPTY QUARTER

Written and photographed
by George Steinmetz

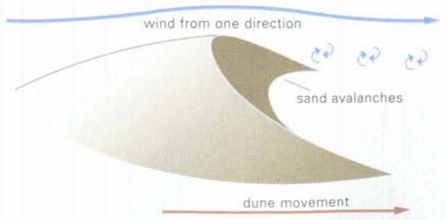
Excerpted and adapted from
*Empty Quarter: A Photographic Journey to the Heart of the Arabian Desert*
George Steinmetz. 2009, Abrams.

The origin of the term "Empty Quarter" is almost as mysterious as the place itself. The name is a direct translation from the Arabic Rub' al-Khali, but where that expression comes from is not clear. Some say it's from a book by the Arabian seafarer Ibn Majid. Others say that the name came from early European explorers who probed the area over many centuries, or because its sands cover a quarter of the Arabian Peninsula. This vast sea of sand, covering more than 650,000 square kilometers (250,000 sq mi), is bigger than France, Belgium and Holland combined. It's also the hottest place on Earth, with summer temperatures over 61 degrees Celsius (142° F) in the shade, and aside from the polar ice caps, one of the most forbidding environments on the planet. In the late 1990's, I had begun a project to photograph all of the world's deserts from the air. To accomplish this, I had learned how to fly a motorized paraglider, which allowed me to access remote landscapes, many of which had never been seen or photographed. My project had already led me to the Sahara in Africa, the Gobi in China and the Atacama in Chile. But after five years, I was finally ready for what Wilfred Thesiger had simply called "the sands."

This page: **In the far east of Saudi Arabia, near the oil field of Shaybah, complex *barchan* dunes take on the shapes of giant egg crates, separated by *sabkhas*, or salt flats. I wouldn't want to fly much farther than 10 miles from a rescue vehicle with my frail little paraglider aircraft. The thought of getting stuck in one of those deadly sand traps in 48-degree (120°F) heat was intimidating.**

Previous spread: **Between Wadi Dawasir and Sharoorah, in southwest Saudi Arabia, parallel *sief* dunes are perhaps the longest in the world. On satellite images we followed individual ridges for almost 500 kilometers (300 mi), and between them were corridors of hard sand and sediment that are actually the bottoms of dry lakes dating back to wetter times 7000 to 9000 years ago. Along these paleo-shores, scientists have found freshwater shells and even the teeth of a hippopotamus.**

Barchan dune



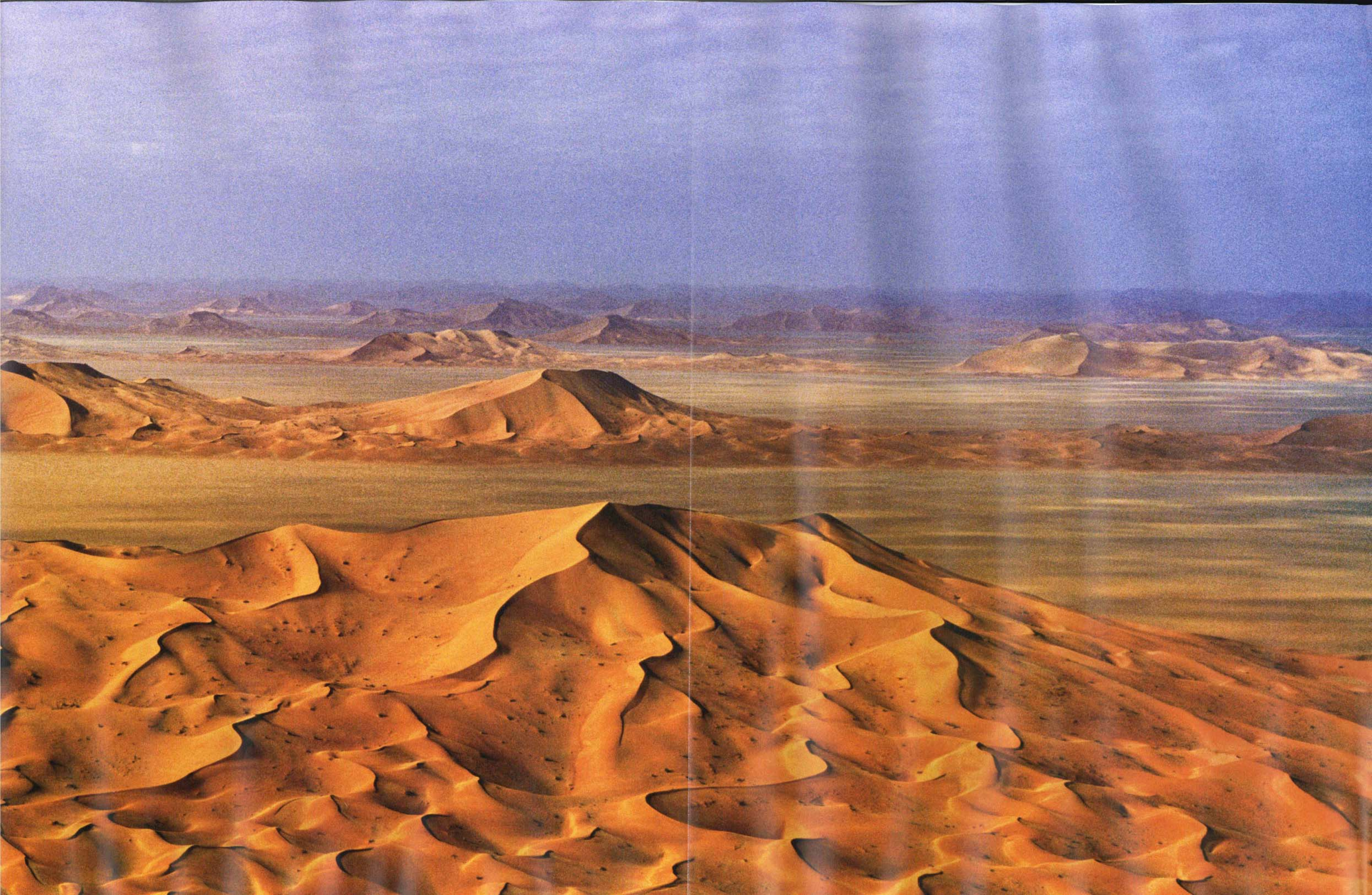

**Dot-shaped dunes spread across the plain of Wadi Hazar in the Yemeni part of the Empty Quarter. It appears as if a change in wind direction has blown the crescent tails off a field of *barchan* dunes.**

**A meandering necklace of clear freshwater lakes wrapping around an enormous orange dune, Khwar Hamidan (also known as Umm al-Haish) is a natural spring, the only permanent source of drinking water in the Empty Quarter. But it is so remote that there are no permanent habitations here, and the only life forms observed were insects and a few wandering camels.**

Star dune


Mobile barchan dunes exchange sand between massive star dunes near the Omani border. The barchans have taken on a rarely seen vein-like shape formed by strong winds, primarily from the east-southeast, which blow the orange-colored sand into long ridges across the salt flats. Our team navigated through this labyrinth of sand with maps made 40 years earlier. The old maps showed exactly the same mega-dune forms in exactly the same places.

Chains of static star dunes form parallel ridges tens of kilometers long in the 'Uruq al-Mutaridah in southeastern Saudi Arabia. I went up several hundred meters to get an overview of these chains (*'uruq*) and realized that the strong winds were blowing from the east-southeast—exactly parallel to the dunes—and the star dunes appeared to be caused by back-eddies that had found their equilibrium. It was a spectacular sight, but the wind was so strong at 600 meters (2000') that I was going backward across the ground while flying into the wind at an airspeed of 50 kilometers per hour (30 mph).



Al-Faw was once an important crossroads for frankincense that moved along the edge of the Empty Quarter by camel caravan. From here, caravans would go on northeast to Mesopotamia; a western route followed the coast of the Red Seat to Petra and Palestine. Al-Faw was excavated by a Saudi team led by 'Abd al-Rahman al-Ansary from the University of Riyadh, revealing a temple, fortified marketplace, residential quarter, cemetery and canal system. The town flourished from the second century BC to the fifth century of our era. It was part of the kingdom of Kinda, which was prosperous enough to have minted its own silver and bronze coins.

Top: **Petrified wood lies sand-blasted on the eastern edge of the Empty Quarter, near Layla. It is most likely a remnant of one of the last ice ages from 10,000 to 35,000 years ago. During those times, the monsoon pattern was altered and the Empty Quarter was covered with lakes. Scientists exploring the Empty Quarter have found water-buffalo skulls and freshwater mollusc shells on what were once ice-age lake shores.**

Left: **Two types of "impactite," rocks formed by meteorite impact: The black rock is formed from molten blobs of material splattered out from the crater, while the white rock is sand fused by heat and pressure along the periphery of the impact point. In the background is the crater itself.**

Right: **One of the points from which the "Frankincense Trail" began, the ancient caravan settlement of Ubar has over the centuries morphed into the modern Omani settlement of Shisur. The frankincense trade started in the mountains of Oman, which separate the Empty Quarter from the coast. The historical references to Ubar were actually not to a town, but to a region where local tribes would scrape the bark of gnarled trees for the sap of *Boswellia sacra*. It was then transported, presumably by donkey, down trails through the stony desert to one of the caravan towns of Ubar, which acted as a gathering point and caravanserai. There it was loaded onto camels for the winter caravans that plied routes around and across the sands all the way to Rome and Persia, where it was worth its weight in gold. Frankincense was used primarily for cremations and religious ceremonies (much as in Byzantine [Eastern Orthodox] rites today), and the trade flourished from around 2800 BC to 300 of our era. Shisur was excavated in 1992 by a team led by Dr. Juris Zarins, who found the remnants of a fort surrounding a well that had apparently caved in, taking most of the small settlement with it. The hole has since been coated in gunnite to prevent further deterioration.**

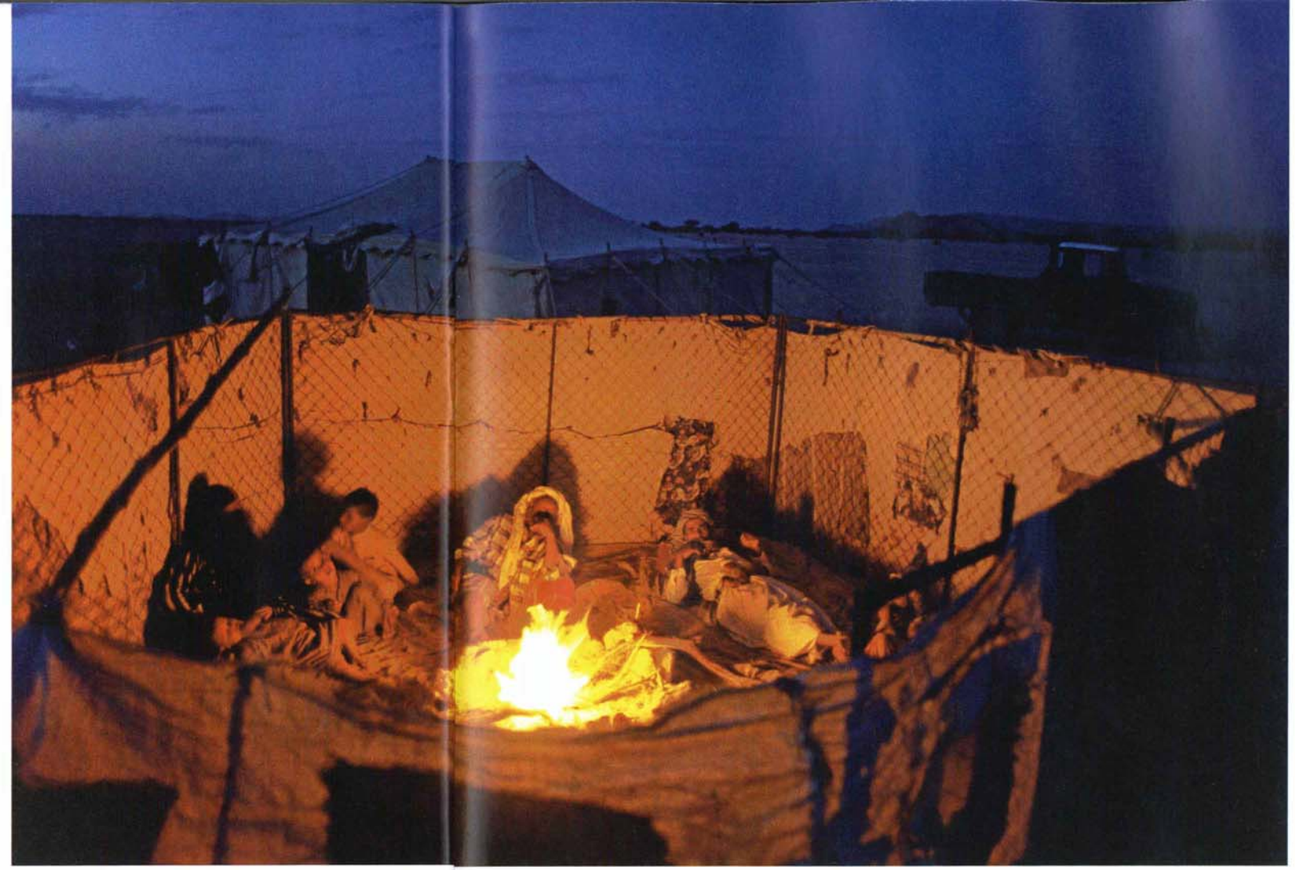


Above: **The most modern trail threads through the eastern Empty Quarter to Saudi Aramco's crude-oil producing and processing facility at Shaybah, but most of the workers fly in on a company jet from Dhahran. Only heavy equipment is trucked in on the road. We had been deep in the desert looking for meteorites, and we drove in cross-country from the southwest through 240 kilometers (150 mi) of virgin dunes using 40-year-old maps, our GPS and a lot of faith in our 4x4 cars. We caught sight of the oil field haul road from the crest of a dune a little after sunrise and, greatly relieved, sped toward it as though it were an asphalt lifeline that might disappear at any moment. The farther east we went, the larger and more beautiful the dunes became. We were entering the largest dune complex in the Empty Quarter.**

Above: **Shaybah was discovered by Aramco in 1968, but because of its remote location and the nature of its oil reservoir, it wasn't considered economically viable before advances in horizontal drilling led to construction that finished in 1998. It remains one of the largest oil fields completed anywhere in the world during the last 20 years. The logistics of building the giant oil facility here are impressive, as the field lay 400 kilometers (250 mi) from the nearest highway. Even the sand used for construction had to be hauled in, as Empty Quarter sand is not suitable for making cement. In three years Saudi Aramco, the world's largest oil company, put in 400 kilometers of paved road, drilled 140 wells, laid a 650-kilometer (400-mi) pipeline to Abqaiq, and built a jet airport and a housing facility for 750 men.**

Below: **Center-pivot irrigation circles growing alfalfa for animal fodder reach to the horizon near Wadi Dawasir at the edge of the Empty Quarter. Each crop circle is about one kilometer (1100 yds) in diameter and sprays water and fertilizer onto barren land to make it bloom. Irrigation water comes from wells 100 to 200 meters deep (330–660') and is "fossil water" that fell as rain thousands of years ago.**

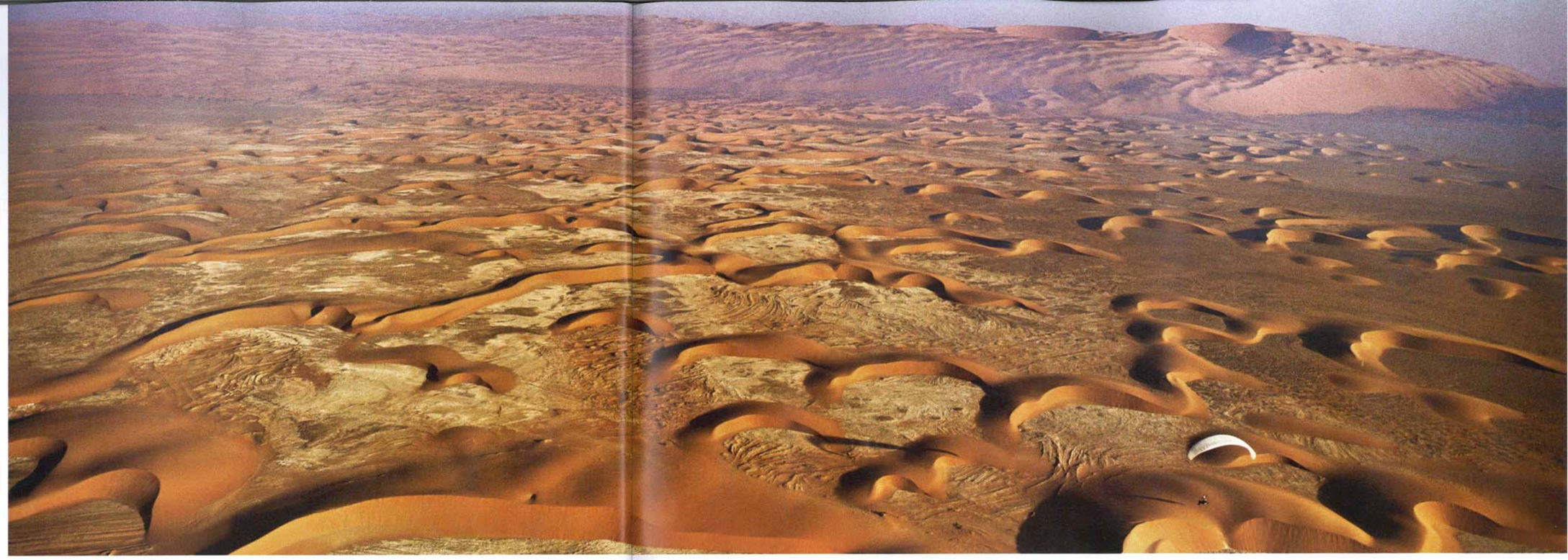




Left: **Near Shabwa, a Bedouin family cooks by a fire surrounded by canvas that keeps out both the wind and the goats. They have goats but no camels, and they were hoping for work as laborers at a nearby archeological site. There was a new school nearby for their children, but three of the four teachers were absent when I visited. Shabwa was once the capital of the Yemeni section of the Empty Quarter, and it thrived from the passing camel caravans of the frankincense trade. Like Marib, its prosperity depended on harnessing seasonal floodwaters to irrigate desert fields, but most of Shabwa's fields have not been used in 2000 years.**

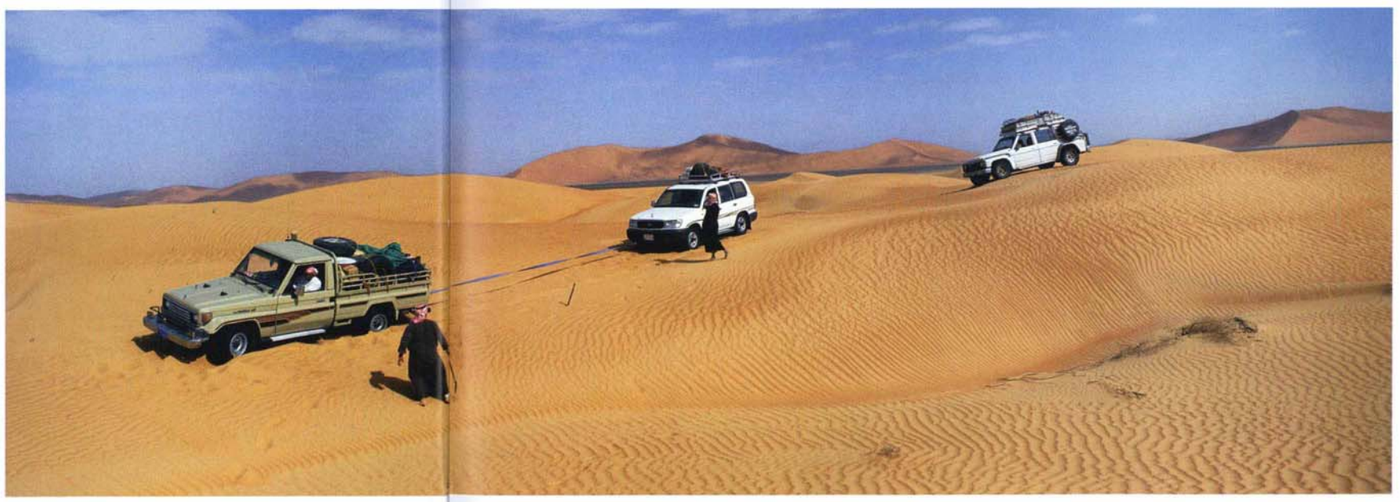
Below: **Outside the town of Marib, Yemen, stone pillars and other remnants of the Mahran Bilqis (Sanctuary of Bilqis) offer clues to a powerful kingdom that may have been ruled by the legendary Queen of Sheba mentioned in both the Qur'an and Bible. (Some believe this may have been the queen's Temple of the Moon.) Marib was once one of the richest towns of Arabia, and a center for the Sabaeans who controlled the region and built a dam to harness seasonal rains for year-round agriculture in the eighth century BC. Marib was also an important stop on the frankincense route from Oman to the Mediterranean. The mahran is now being excavated for the second time in 1500 years. As I circled overhead, I could see the bewilderment on many upturned faces, as a motorized paraglider is an oddity in the deserts of Yemen.**

Right: **I wasn't out there for the thrill of flying a crazy aircraft high above the sand. More times than I care to remember, I found myself subjugating abject fear for the sake of a picture or even the chance of a picture. I simply wanted to create a visual record of what I guessed would be one of the most astoundingly beautiful places on Earth that few had ever seen.**

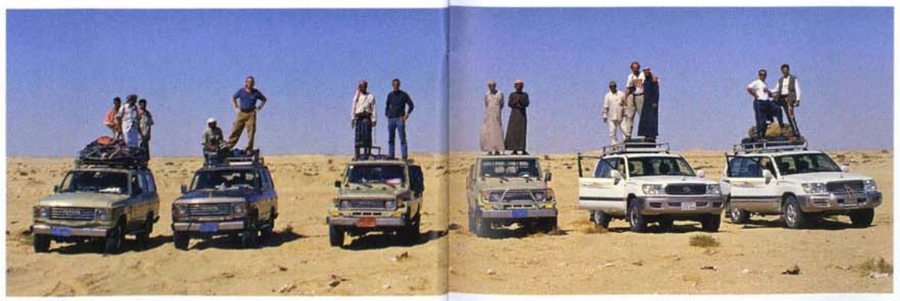


Below: **My travels in Arabia would simply not have been possible without the hospitality of the Arab people—such as the guards at the Markaz Dar Balutan border post, who served us coffee before we crossed from Saudi Arabia into Oman. Nowhere on earth have I experienced the level of generosity that they extended toward me, a perfect stranger in their world. Whether prince or barefoot Bedouin, the Arabs cared for me in a way that was humbling, to say the least.**

Bottom right: **Teams and cars from both Saudi Arabia and Yemen pose for a group portrait on the day our team (photographer George Steinmetz, writer Donovan Webster and motorized paraglider pilot Alain Arnoux) crossed the border from Oman to Yemen. To travel safely in remote parts of the Empty Quarter, each team needed three cars: one for people, one for motorized paragliders and one for fuel and water.**



Left: **While Ali, Alain and I dug the lead car out of the sand, Banounah heated up a cooked chicken that had been wrapped in tin foil by our hosts back at Ardah. A sandstorm came up, which made eating particularly miserable as we had no tents and the cars were too filled with equipment to serve as a dining room. Alain was so exhausted he skipped eating and lay down on a dune, pulling his fleece jacket over his head to protect it from the blowing sand, and promptly fell asleep, undisturbed by the sand swirling around him.**



**George Steinmetz** (www.GeorgeSteinmetz.com) has been a regular contributor to *National Geographic* and *GEO* magazines for more than 20 years. He has won numerous awards for photography, including two first prizes from World Press Photo.

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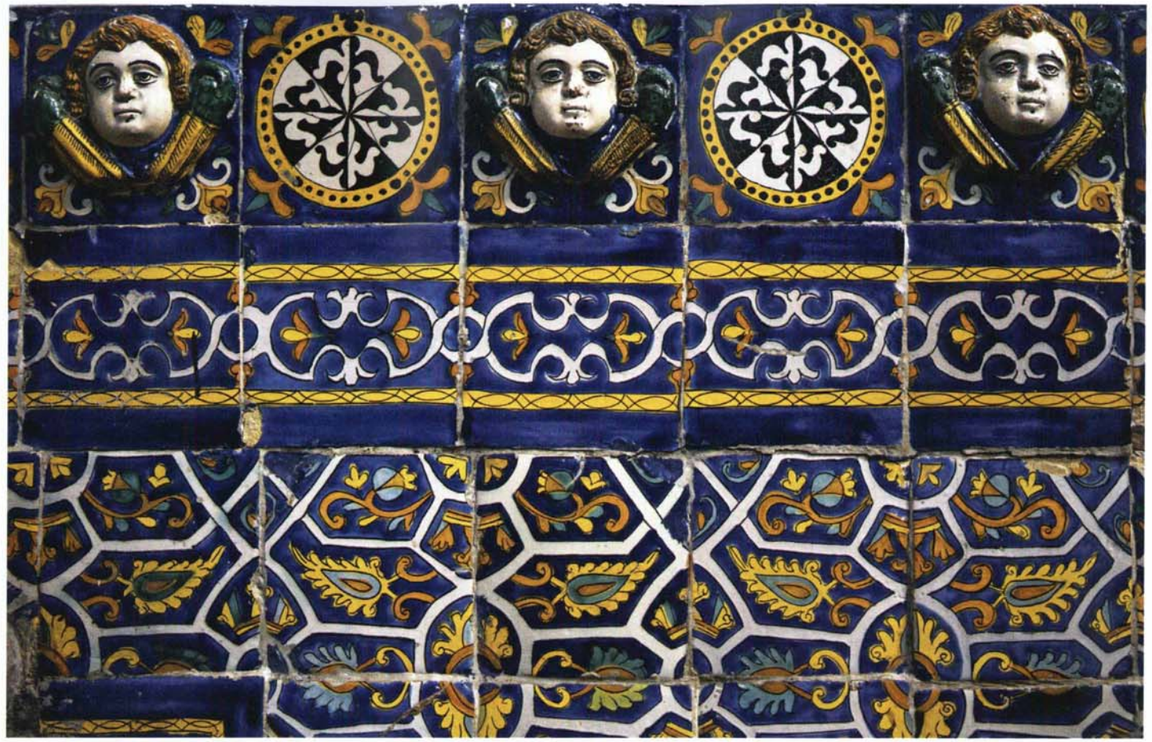
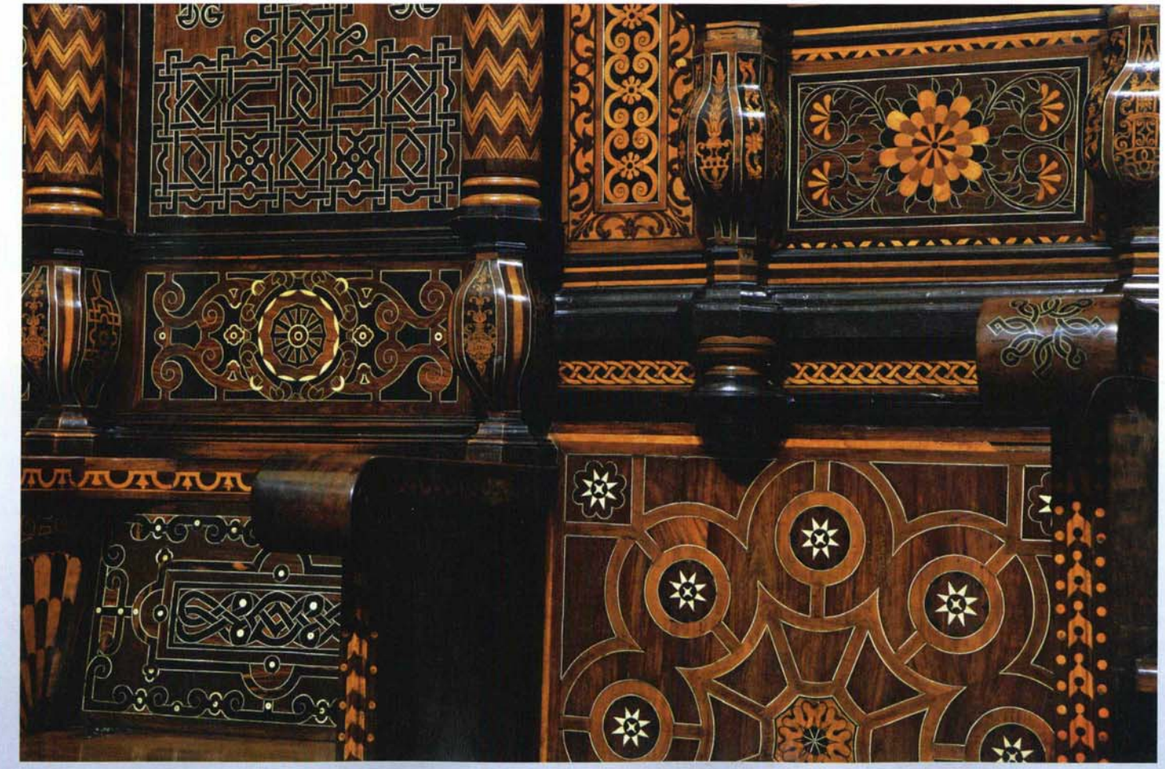
# Mexico's Colors of Three Cultures

Written by Louis Werner

Photographed by Kevin Bubriski







When an earthquake of magnitude 7.0 struck the city of Puebla, Mexico on June 15, 1999, it damaged many of the arches and vaults of the fine churches and civic buildings near the *zócalo*, or main square. Less noticed was the harm done across the river to a humble Guadalupe chapel in the late 17th-century church of San Juan del Río, whose ribbed dome sustained several structural cracks.

One of only two in Puebla that date from that period, the dome tells a fascinating story about the architectural legacy of the city and the surrounding region—a legacy that blends indigenous Mexican, Spanish and Moorish traditions into a beautiful yet practical whole. The type of ribbed dome at San Juan del Río, along with many of the city's other colonial architectural elements, are of the *mudéjar* style. The name probably derives from the Arabic *mudajjanun* ("those permitted to remain"), and the construction technique can be traced back to al-Andalus in southern Spain, the region ruled by Muslims from the eighth to the 15th centuries, and to North Africa. It was brought to the New World by the Spanish and built by Native American craftsmen.

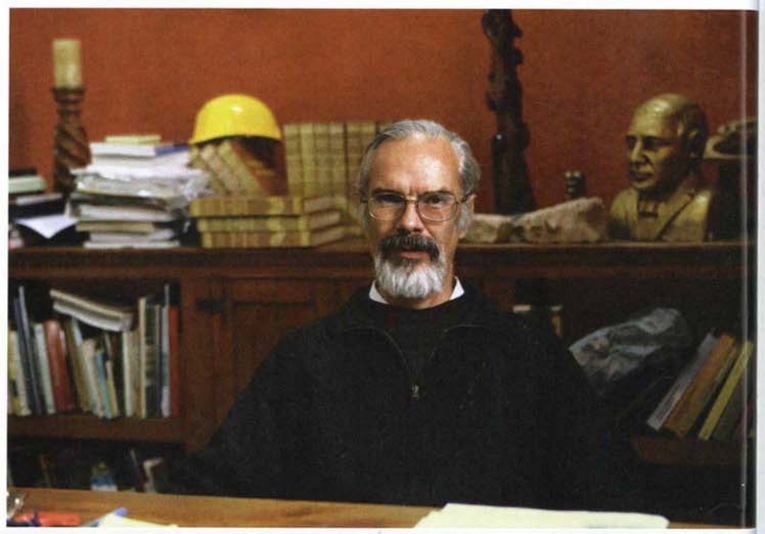
The Public Autonomous University of Puebla recently established a Center for Hispano-Mudéjar Studies, led by architecture professor Dolores Dib Alvarez, whose maiden name, Dib, is that of her Syrian grandfather. The center's mission is to bring together Mexican, Spanish and Moroccan scholars to document the continuities, lineages and growth patterns between and among their cultures. "We Mexicans always say our country is a melting pot," she says, "but we often argue over which flavors are dominant. In Puebla, both in its architecture and its bloodlines, I think the Arab flavor is unmistakable." Indeed, a monument in the zócalo honors Puebla's Syrian-Lebanese immigrant community.

**The home of Puebla architect Jose Antonio Romano features Moorish Revival or *neo-árabe* ceiling and wall designs inspired by the 14th-century Alcázar Real in Seville, Spain.**

Dib Alvarez grew up very near two other reminders of her city's Arab roots. One is a minaret, the other a house inspired by the Alhambra palace in Granada, Spain. Both are examples of what she calls *neo-árabe* architecture. At the turn of the 19th century, a Moorish Revival fashion based on the traditions of al-Andalus came to Puebla. Orientalist smoking rooms, minarets as architectural follies and public buildings inspired by elements of Spain's famed, multicolumned Córdoba mosque—including buildings as important as the Congreso del Estado—can be found all over town, holding up a kind of funhouse mirror to Puebla's mudéjar inheritance and to the classic Moorish materials of carved stucco, wooden inlay and ceramic tile.

Left: **Colorful *azulejos* (ceramic tiles) cover the façade of the church of Santa María de Tonantzintla in Cholula, as well as a wall in a chapel,** opposite, top, **in Puebla's Santo Domingo church.** Opposite, lower: **Intricate inlays, strapwork and marquetry make each wooden seat in the Puebla cathedral's choir stall unique.** Previous spread: **Tiles and plasterwork in the Congreso del Estado's two-story covered courtyard reflect Puebla's Moorish Revival heritage and make it one of the city's leading cultural attractions.**

Right: **"Both in its architecture and in its bloodlines, I think the Arab flavor is unmistakable" in Puebla, says Delores Dib Alvarez, a professor of architecture. The granddaughter of a Syrian immigrant, she helped establish the Center for Hispano-Mudéjar Studies.** Below, right: **Architect Leopoldo García Lastra has identified *mudéjar* elements throughout Puebla, and he directs Puebla's school of restoration art, founded in 1999 to repair earthquake-damaged buildings.**

Even a newspaper kiosk, now sadly demolished, reflected this style.

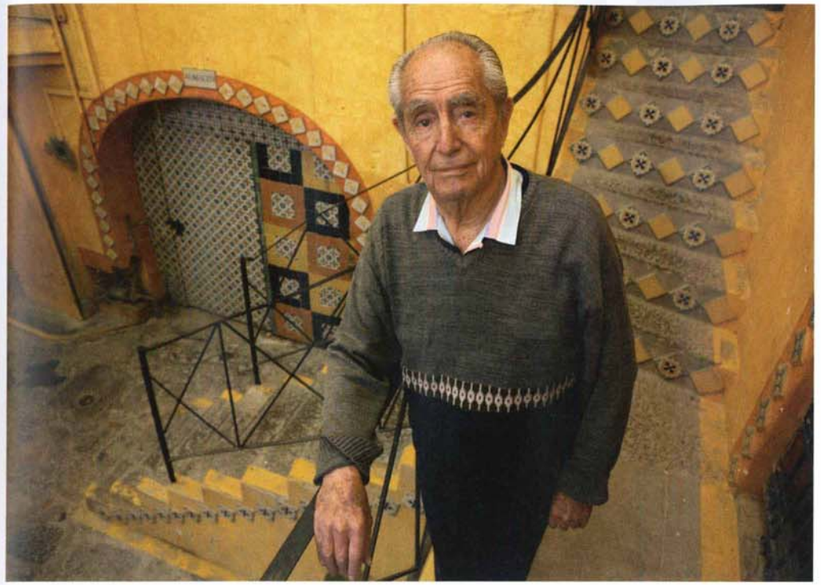
The term *mudéjar*, in its primary sense, refers to the Muslims who stayed in Spain after the reconquest of the peninsula by Christian forces, which was completed in 1492 with the capture of Granada, and to their descendants after the forced conversions of the 16th and 17th centuries. But it also has a cultural sense, referring to the esthetics and the artistic techniques that went into building such Moorish landmarks as the Alhambra. In the years following the reconquest, this stylistic inheritance was fully embraced by Spanish Christians, who in turn carried it across the world.

Even in the name *Guadalupe*, the locality associated with the Catholic patroness of the Americas, one can hear the echo of Arab, Native American and Spanish voices. As tradition has it, in December 1531, just 10 years after Cortés had conquered the Aztecs, an apparition of the Virgin Mary appeared before a young Indian man and spoke her name. When the man repeated the name to the bishop of Mexico, he recorded it as "Guadalupe," a toponym from the Extremadura region of Spain, derived from the words *wadi* and *lupus*, respectively Arabic for "river" and Latin for "wolf."

Of course, two Indians speaking Náhuatl, the language of the Aztecs, were entirely unlikely to have recited a Spanish name to the bishop. And the bishop was equally unlikely to have heard them correctly when they gave him the name in their own language: *coatlaxopeuh*, or "she who crushes the serpent"–a name loaded with both Christian and Aztec religious symbolism. Thus the name *Guadalupe*, both in the way it was first understood and the way it was immediately misunderstood, itself braids together three Mexican cultures.

In fact, the country's tri-cultural architecture is obvious whenever a Mexican architect opens his mouth. The Spanish *arquitecto* comes from the Greek word for "master builder." *Albañilería*, the craft of masonry, comes from the Arabic word *al-binaa'* ("construction"). And when his job is complete, an architect may have to go to the *tlapalería* ("paint store"), a word derived from the Náhuatl *tlapalli* ("color").





An archaic Spanish word for architect is *alarife*, from the Arabic *al-'arif*, "the one who knows," or master–as in the title of a builder's manual published in Seville in 1633, the *Breve Compendio de la Carpintería de lo Blanco y Tratado de Alarifes (A Brief Compendium on Wooden Joinery and a Treatise for Architects)*. In the Mexican architectural dictionary, the terms *aljibe* and *amanal*, both meaning "cistern," are next to one another, the former derived from the Arabic *al-jubb*, with the same definition, and the latter a Náhuatl compound of *atl* ("water") and *manalli* ("dam").

The Guadalupe chapel's dome, or *media naranja* ("half-orange"), as it is called in Spanish, is divided into lobes just like the sections of a real orange, and is modeled closely on those of the mosques in Córdoba and in Kairouan, Tunisia. And the fact that masonry domes and vaults suffered greater earthquake damage than wooden ceilings did tells about another kind of mudéjar legacy–the joined wooden ceilings called *alfarjes* in Spanish, a word derived from the Arabic *al-farsh* ("carpet"), which can still be seen today in the *madrassas* of Fez and Marrakesh in Morocco and in several rooms of the Alhambra.

> Mexico's tri-cultural architecture is obvious whenever an architect opens his mouth.

The two remaining churches near Puebla that have retained their original 17th-century alfarjes–one the convent church of San Francisco in the adjacent state of Tlaxcala and the other the church of San Diego de Alcalá in the town of Huejotzingo–both emerged from the earthquake unscathed. Their ceilings were both probably erected in the 1660's by the brothers Juan and José de Mora, whose names are in the registry of Puebla's carpenters' guild. In fact, most of Mexico's earliest colonial churches–including the first cathedrals in Mexico City and Puebla–were built with this kind of ceiling, which is economical and fast to put up. But as the communities they served grew more prosperous, most were replaced by higher and more ostentatious–and more rigid–masonry vaults and domes that needed repair every time Mexico was shaken by its frequent earthquakes.

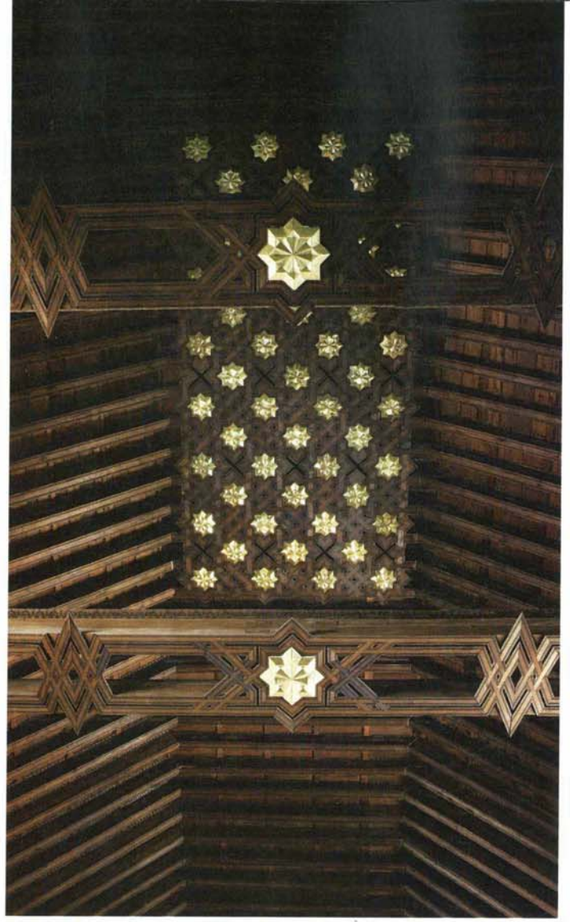
Both these alfarjes are in the *par y nudillo* ("pair and knuckle") style. It consists of a three-plane, tent-like construction that follows the roof line and whose face directly overhead is called the *almizate*, from the Arabic word *al-masqat*, meaning "a place where things fall from above." The design in the nudillo consists of small wooden pieces called *almarbates* (from the Arabic *al-mirbat*, meaning "tie" or "rope") in the shapes of squares, diamonds, chevrons, narrow rectangles and the like. They are fitted and joined to make a pattern of stars set within a dense array of over-and-under strapwork, or banded design, that is not unlike the art of *zillij* (cut-tile mosaic) in Fez.

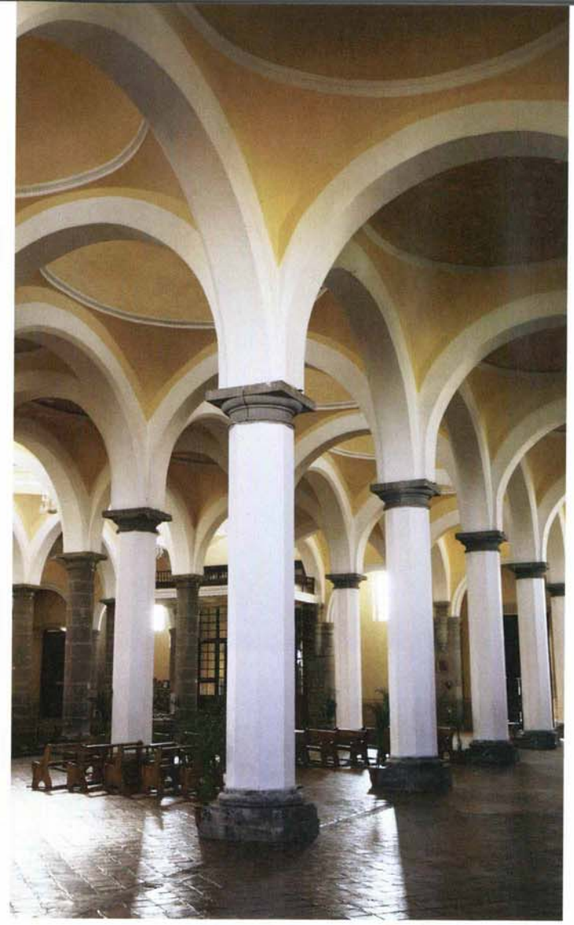
Tlaxcala boasts two other signature mudéjar elements: On the zócalo is the façade of the 16th-century *alhóndiga*, or public storehouse, a word derived from the Arabic *al-funduq* of the same meaning; and over the church's main portal is an arch circumscribed by a square in a shape called an *alfiz*, from the Arabic *al-hayyiz*, a geometric term meaning "boundary" or "limit."

Rafael López Guzmán at the University of Granada has extensively studied mudéjar carpentry in the New World. He calls Tlaxcala's alfarje ceiling, which measures 41 by 11.5 meters (135 x 38'), "the perfect mudéjar architectural space." He also notes how its assembly exhibits certain parallels with pre-Columbian carpentry skills. The Aztecs often constructed their decorative ceilings with wood, using thin, planed boards called *tejamanil* that could be placed across beams and rafters and brightly painted.

In 1596, the Franciscan Gerónimo de Mendieta was in charge of building his order's convent in Huejotzingo, just across the town square from where the church of San Diego was soon to be built. He praised the building acumen of his native artisans,

Above: **Isauro Uriarte, 89, is the fourth-generation owner of Uriarte Telavera, a ceramic factory in Puebla whose décor reflects its 200-year history.** Right: **At Uriarte Telavera, a craftswoman glazes an earthenware dish.**





Above: **Fitted with stars set in wooden strapwork, the *alfarje*, or joined-wood ceiling, of the church of San Francisco in nearby Tlaxcala state is one of two such ceilings in the region.** Above right: **The vaulted ceiling of the 16th-century Capilla Real ("royal chapel") in Cholula reflects that of the famous mosque in Córdoba, Spain.**

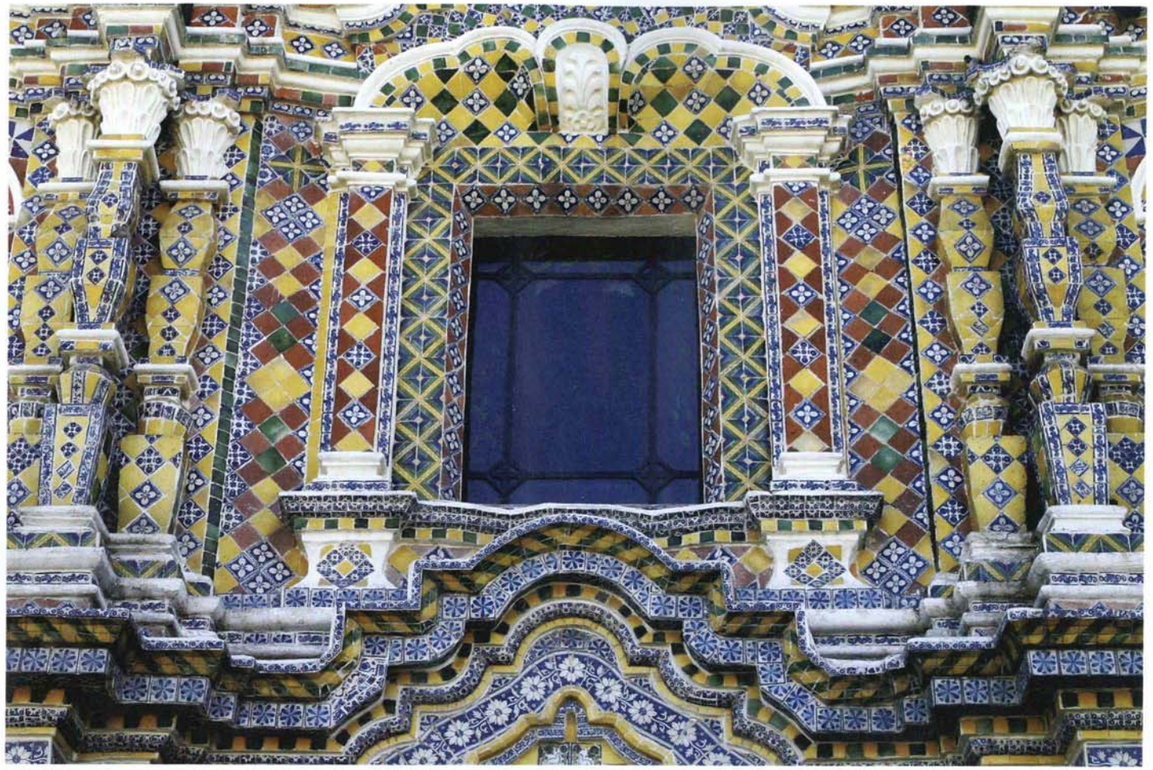
writing, "The Indians already had technical skills, just as they have learned from the Spanish to perfect their talents. Then just as now, there were ironworkers, roofers, stonecutters, carpenters and carvers."

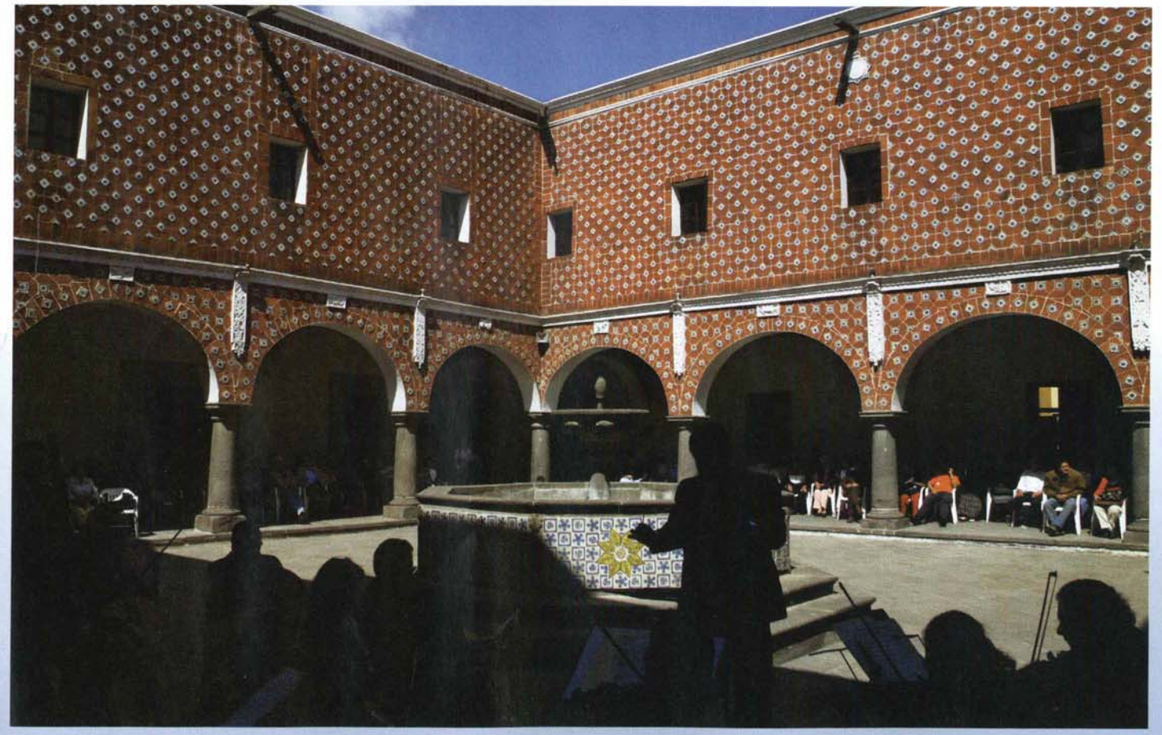
After the 1999 earthquake, Puebla established a training center for the arts of restoration, the Escuela Taller de Capacitación en Restauración. It is led by Leopoldo García Lastra, an architect who has made it a personal mission to seek out his city's less-obvious mudéjar references–such as the lone horseshoe arch in the early 17th-century patio of the San Pedro hospital, or the three- and five-lobed arches in Puebla's churches, similar to the blind arches in the Córdoba mosque's prayer niche and its Hakim II portal.

García Lastra likes to tell his students about the earliest Mexican treatise on mudéjar design. Written by the Carmelite brother Fray Andrés de San Miguel in the late 1630's, it contains instructions on how to create octagonal strapwork patterns with triangular templates. His accompanying geometric analysis of stalactite-like *mocárabes*–in Arabic *muqarnas*–is interesting because the mocárabe is not actually found in Mexican colonial architecture. The only explanation might be Fray Andrés's birthplace, Medina Sidonia in Andalusia, where he would have seen such decoration in any number of Moorish buildings. The terminology he uses to describe the mocárabes' various three-dimensional solids and two-dimensional faces–*adaza*, *atazia*, *jayri*–are otherwise unknown in Spanish and presumably have Arabic origins.

> Puebla chose *azulejos* as its signature building facing to make itself stand apart from the capital, Mexico City.

The three most common decorative techniques of the mudéjar period–ceramic tile, wooden inlay and stucco, whose names in Spanish also have Arabic etymologies in two cases –can all be found in Puebla's later buildings, erected at the height of the colonial baroque period. Puebla is perhaps most famous for its ceramic tile, or *azulejo*, a Spanish word derived from the classical Arabic *al-zujaj* ("glass") via the Moroccan Arabic *al-zillij*. It adorns interior walls, façades and exterior domes, often checkerboarded with terra-cotta bricks or tiles in a pattern called *olambrilla*. It is said that Puebla, as rich and proud as Mexico





Opposite, top: **The ornate tilework on the façade of the baroque church of Santa María de Tonantzintla dazzles the eye.** Lower: **The fountain and walls in the cloister of the former convent of Santa Rosa, now an art museum, are also covered in handcrafted tiles.**

City but always in its shadow, chose azulejos as its signature building facing to make itself stand apart from the capital, where carved-stone façades predominate.

The apogee of azulejo art is found on the façade of the mid-18th-century church of San Francisco Acatepec, in an outlying farming district of Puebla, which is covered top to bottom in tiles. In the words of the late Spanish poet and painter José Moreno Villa, it "approaches delirium.... All is color and brilliance." Although none of the tiles is of typical mudéjar style, the overall effect is of *alicatado*, or cut-tile decoration. (The word is from the Arabic *al-qat'*, "cutting.")

Besides the use of azulejo, most Mexican baroque church façades like Acatepec hide another essential element of mudéjar design, according to John Moffitt, professor emeritus at New Mexico State University and the author of *The Islamic Design Module in Latin America*. He has used computer analysis to show how Spanish colonial architects, just like their predecessors in al-Andalus, used a grid based on the Pythagorean triangle's 3:4:5 proportions to generate both the overall dimensions and the component parts of many buildings.

A world away from computers is Uriarte Talavera, a 200-year-old ceramic-tile factory in downtown Puebla that still makes its wares in traditional shapes and designs. Some of its reproductions of plates and jars from museum collections are decorated with typical Arab figures–lute players, horsemen and hunters–all in flowing robes. The artisans' blue-and-white winding vine design, which they call *morisco*, is in fact a typical mudéjar motif known as *ataurique*, from the Arabic *tawriq*, "the sprouting of leaves."

The art of wooden inlay–*taracea* in Spanish, from the Arabic *tarsi'*–reached its peak in the Puebla cathedral's choir stalls, made by Pedro Muñoz in 1719. Rosewood, ebony, mahogany and ivory were used on the seatbacks to create strapwork designs as complicated as game boards for advanced players. The work reflects a delight in each busy pattern's juxtaposition with its very different seatmate's, and the technique itself has antecedents in Puebla's mudéjar period, as attested by the 16th- and 17th-century inlaid boxes in its Museo Bello y González and by the masterworks in Mexico City's Franz Mayer Museum of Decorative Arts.

Plasterwork, in Spanish called *argamasa* or *yesería*, was rarely carved or molded in Mexico's mudéjar period. For that, Puebla had to wait for its 19th-century Moorish Revival. Yet on the high baroque façade of the late 18th-century Casa de Alfeñique (a word meaning "marzipan" that comes from the Arabic *al-fanid*), one finds an exuberance of decoration: olambrilla tiles topped by a whipped-up confection of wildly carved stucco above its upper-story windows and along its cornice, almost as if a foaming ocean wave had crashed upon it and frozen in place.

The carved plaster upper walls in the Congreso del Estado's neo-árabe patio, in the Conservatory of Music's secret music room and, above all, in the smoking room of a private downtown residence are far closer in spirit to their models in Seville's Alcázar Real or Granada's Alhambra than to anything from Puebla's own mudéjar period. Indeed, it took a team of interior decorators from Seville, the Arpa brothers, and Puebla-born, Paris-educated architect Eduardo Tamariz, who had traveled in North Africa, all working together at the turn of the 20th century, to translate this vision into a suitable Mexican version.

José Antonio Romano and his wife own the house with the city's most completely imagined Orientalist interior space. Just as in a classic Moroccan interior, the room they use as a salon is divided into two sections by a horseshoe arch supported by delicate Mexican alabaster columns that are topped by cubic Nasrid capitals. The bottom half of the walls is covered with Spanish-made zillij tiles, the top half with plaster that seems hand-carved, although closer examination reveals that its ataurique motif and gilded calligraphic cartouches were stamped from a mold.

Upper: **Borrowing from classical Moroccan style, a horseshoe arch divides the salon in the home of Puebla architect José Antonio Romano, giving it a distinctively Orientalist look.** Right: ***Azulejo* tiles arranged in playful zigzag patterns accent the façade of the church of Guadalupe in Puebla, while police keep watch over traffic.**


Top: **The minaret at Molino ("mill") San Francisco represents the Moorish Revival architectural style that flourished in Puebla around the turn of the 19th century.** Above: ***Pollo con mole poblano* mixes Spanish, Arab and native ingredients in a sauce that offers yet another taste of the region's tri-cultural heritage.**

In such a room, it would not seem out of place to serve a dinner of *mole poblano*, the rich dark sauce from Puebla that combines chiles, chocolate and ground almonds. It is the city's signature dish and has come to symbolize the best in Mexican cuisine. Indeed, such a concoction, invented by the Spanish and mixing Arab and native ingredients, is not far in spirit from the *sevillano* designers who dared to top a locally quarried column with a Moorish-inspired capital. And, sprinkled atop any mole made by a self-respecting Poblano chef, there must be a handful of *ajonjolí*, sesame seed, a Middle Eastern and Spanish ingredient whose name too derives–no surprise here–from the Andalusian Arabic.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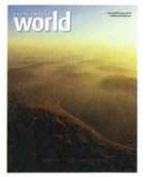
Granada: S/O 03
*zillij*: M/J 01, N/D 05
Arabic-origin words: J/F 93, M/A 07
*muqarnas*: M/J 00, J/A 06
strapwork: M/J 98
Alhambra: J/A 06
Arab influence in Mexican cuisine: M/J 04

# Classroom Guide




FOR STUDENTS
We hope this two-page guide will help sharpen your reading skills and deepen your understanding of this issue's articles.

FOR TEACHERS
We encourage reproduction and adaptation of these ideas, freely and without further permission from *Saudi Aramco World*, by teachers at any level, whether working in a classroom or through home study.

—THE EDITORS

**Curriculum Assignments**
To see alignments with national standards for all articles in this issue, click "Curriculum Alignments" at www.saudiaramcoworld.com.


WRITTEN BY JULIE WEISS

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## CLASS ACTIVITIES

*This issue's Classroom Guide focuses on two skills that may seem easy, but in the activities that follow, you will find ways to better understand what you **read** and what you **see**. If we think of them as **Reading Strategies** and **Viewing Strategies**, we are ready to approach them as skills that can be improved with practice.*

### Reading Strategies

Sometimes you will read something—a book or an article—and you'll find it difficult. It may contain words you don't know, or it may make an argument that you have trouble following. There are skills you can learn to help you with difficult reading. With this issue, you'll learn some of those skills using the article "Mexico's Colors of Three Cultures."

**1. Getting the Big Picture**

When you sit down with a magazine article or a book, it helps to get a sense of what it's about before you actually start reading it. Some people call this "pre-reading," and it can help you better understand what you are about to read. Do the following pre-reading exercises with a partner. Make notes of what you find as you do each step.

**a.** Start with the opening spread of "Mexico's Colors of Three Cultures" on pages 34 and 35. Without reading, describe the picture. What kind of place do you think it shows? What makes you think so? How would you describe the floor, the walls and the doorways? What do you think the people are doing? Given what's going on in the picture, what do you think the headline refers to? Based on both words and images, what do you think the article will be about? Remember that there are no right or wrong answers to these questions. Notice that now you have some expectations and some questions—and this is exactly what pre-reading is about, because now you're likely to read more carefully, because you'll want to see if your ideas were right.

**b.** Now look at the other four spreads. Again, don't read the article unless something leaps out at you and you want to read it. (No harm in that!) Rather, focus on the pictures and the captions: Which images do you find most interesting? Why? What do the captions tell you about them? Discuss the spreads with your partner. Pause after each spread and ask yourself what new information you've gained about the article. Does the new information change your expectations of what the article is about? Do you need to revise your prediction? What questions come up for you as you look at the pages of the article? Write them down, because when you read the article, you may find answers.

**c.** After you've completed these activities, make a final prediction about what you expect the article to be about. As you read, you're going to check to see how accurate your prediction is, and you'll revise it again as you learn more.

**2. The Beginning: Finding out what the article is about**

Here's a hint that will help you over and over again, not just with this article: *Magazine articles often begin with a brief interesting story.* It's called a "hook" because its job is to hook readers so that they'll keep reading. Once you're hooked, the writer connects the brief interesting story to the articles' larger topic. You want to pay particular attention to the hook because that's where you're going to find out what the article is about.

Now, read the first three paragraphs of "Mexico's Colors of Three Cultures." In those three paragraphs, you'll find the article's *thesis*—what the author is going to show you. Underline it. With your partner, compare it with your predictions about the article. Revise your predictions if necessary.

**3. Organizing Information**

Remember that everything in the article is there to support the thesis. Write the thesis down on a piece of paper and keep it with you as you read. If you read something and you're not sure why it's there, reread the thesis. Ask yourself how what you've read relates to it. That should help keep you on track.

Notice as you read that the author of this article uses two kinds of evidence to make his points: words and architecture. He writes about them together, sometimes explaining word roots while he is describing architectural features. As a reader, you want to be sure that you see and understand both types of evidence. One way to do that is to make a graphic organizer to help you sort out the information, like the table on the next page.

Make your own copy of the table, with blank rows that you can fill in. In the left-hand column, write the Spanish word and what it means in English. *Alarife*, for example, means "architect." In the next column, write the Arabic root of the word and what it means. In this case it's *al-arif*, which means "the one who knows." The third column here will be blank because *alarife* does not have an Aztec root. The right-hand column will also be blank because the word *alarife* doesn't describe an architectural feature.

Notice that not every column is filled in. That's fine. The goal is not to fill in all the boxes of the chart. The goal is to use the chart to help you clarify your understanding of the content of the article.

| Term in Spanish & (English) | Arabic Root & (English) | Aztec Root | How architectural meaning derives from two or three cultures |
|---|---|---|---|
| alarife (architect) | al-'arif the one who knows | | |
| aljibe (cistern) amanal | al-jubb (cistern) | Atl manalli | |
| alfarjes | al-farsh (carpet) | | Joined wooden ceiling, similar to those in Fez, Marrakesh and at Alhambra; found in various places in Mexico |

What you're doing as you make your chart is separating out different threads of content. One thread defines word roots to show how three cultures have blended, and the other thread describes architectural features that also show how three cultures have blended. Separating threads, you can see each one more clearly, and that helps you understand the article.

At the end, when you've read the whole article, talk with your partner about what you've read and the chart you've made. Together, write a one-paragraph summary of the article. The first sentence should be the article's thesis—its main point. Then write three or so sentences that explain how the article supports the thesis. Finally, write a concluding sentence that pulls it all together.

**4. Reflecting on the Process**

Another way to improve your reading comprehension—and your learning in general—is to reflect on how you learn. Think about the steps you took to read and understand this article. Which ones helped you most? Which would you be likely to use again? What other strategies might you have used instead of the strategies presented here? Why would they have been helpful? Are there other things you can think of that would be helpful? Discuss these with your partner or as a whole class.

### Viewing Strategies

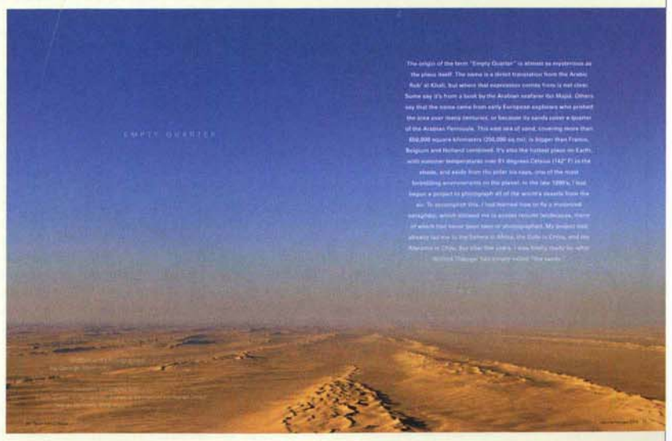
Now that you've improved your reading skills, you can improve another set of skills. As with reading words, there are strategies you can use to improve your understanding of visual images.

For these activities, you're going to focus on the photos in "Empty Quarter." If you read the words on the first spread, you'll see that you'll be looking at photos of a desert. Put crudely, you could say that you're going to be looking at a bunch of pictures of sand. That doesn't sound all that interesting, does it? But you're going to find that these photos are extremely beautiful. Keep in mind this question: How did this photographer make such beautiful images of something that doesn't sound at first as though it would be beautiful?

Start with the image on the first spread. Photographs often make their first impact on a viewer emotionally. When you look at a photo, you probably feel something. Look at this photo. In a small group, answer the question: How does the photo make me feel? Don't think too hard about it. Just say whatever comes to mind. Do you feel lonely? Tired? Thoughtful? Scared? Now think about why you feel that way. In other words, what is it about the photo that inspires those feelings? One way to get at that is to ask yourself, "How would I feel if I were in that place?" To answer that, think about your senses: What would you see? What would you smell? What would you feel? What would you taste? What would you hear?

Now let's look at more specifics in the photo. Notice that the photo is split in thirds horizontally. Run your finger over the two "lines" that separate the photo into thirds. How does color help you distinguish between the three segments of the photo? Why do you think the photographer decided to include so much more sky than earth in the photo? He could have aimed his camera a little differently, and the horizon line could have been across the middle of the page. Or he could have chosen to put the horizon line close to the top of the page, with only a small amount of sky showing. What effect does this way of dividing the photo have on you as a viewer?

The "earth" part of the photo makes up two of the three parts of the photo. How does the photo convey a feeling of depth? You're looking, after all, at a flat picture. But the photo represents a three-dimensional place. Run your finger over the parts of the photo that let you know that the desert in the image is three-dimensional.

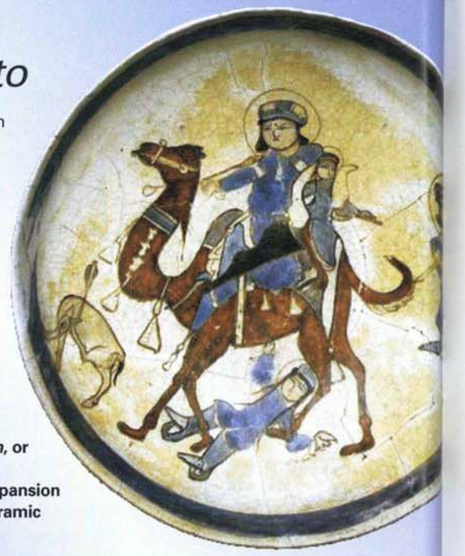


Compare this image with the photo on the four-page gatefold. This photograph uses a different technique to convey depth. How much of the photo shows earth, and how much shows sky? How many "horizon" lines do you see? What does this photo tell you about the Empty Quarter that's similar to what the first photo told you? What does it tell you that's different?

Now, working with a small group, choose one of the other photos in "Empty Quarter." Make sure that all the photos have been assigned to at least one group. Use the viewing skills you have used—plus any others you can think of—to help you understand your assigned photo. Present your photo and your group's analysis to the class.

Finally, apply what you've learned about viewing to take your own pictures. Choose something to photograph that you don't think is very interesting visually. You might choose to photograph your desk, for example, or a book, or a glove. (No pictures of cute dogs for this activity!) If you have a camera, take different pictures of the object. If you don't have a camera, make a square or rectangular frame out of cardboard or construction paper, and hold it up as if you were taking a picture. (You'll be surprised how well it works.) Try different types of pictures, like viewing the object head-on in one photo and from an angle in another. You could center the object in the photo, or you can try having it be lower or higher than center, or off to one side. You might even try making an abstract photo of the object, one in which the viewer can't be sure what the object is. How will lighting affect your object? How could you change that? If you can, make a display of your photos—either on a poster or on a computer. Look at your peers' photo spreads. Discuss what you like about them.

# The Silk Road: *Ancient Pathway to the Modern World* allows the visitor to "travel" from Xi'an, China's Tang Dynasty capital, to Turfan, a bustling oasis; Samarkand, home of prosperous merchants; and Baghdad, a meeting place for scholars, scientists and philosophers, in the period between 600 and 1200, with dioramas and interactive displays from each city. For centuries, the Silk Road was a vast and busy network connecting Asia and the Mediterranean where people met, transported goods and conducted trade, and in the process shared culture, religion and technology. Feathers, furs, spices, silks and other trade goods; live, working silkworms; a cutaway replica of part of a dhow; a working model of a water clock; sounds and smells; and video clips of papermaking and glassblowing are among the exhibits. Live Silk Road music on Sunday afternoons. American Museum of Natural History, **New York**, through August 15.



**This 13th-century Persian ceramic bowl depicts a scene from the *Shahnamah*, or *Book of Kings*, about the fifth-century Sasanian king Bahram V, who was challenged to feats of archery by his favorite lyre player, Azadeh. With the expansion of maritime routes in the 10th century, larger and heavier goods—such as ceramic bowls—could be easily and profitably transported.**

CURRENT **January**

**Persian Visions:** *Contemporary Photography From Iran* presents more than 60 images that provide a revealing view of Iranian life and experience. The 20 artists featured are among Iran's most celebrated and include Esmail Abbasi, Bahman Jalali, Shariyar Tavakoli, Mehran Mohajer, Shoukoufeh Alidousti and Ebrahim Kahdem-Bayatvin. Some have lived abroad and returned to view their homeland from a changed perspective. Anti-exotic and specific, these images make up the first survey of contemporary Iranian photography to be presented in the United States. Haggerty Museum of Art, **Milwaukee, Wisconsin**, through January 17; **Cedar Rapids [Iowa]** Museum of Art, February 21 through May 10.

**Maharajas:** *The Splendour of India's Royal Courts* opens with the period of chaos and adventure that followed the collapse of the Mughal empire in the early 18th century and closes at the end of British rule in 1947. It explores the extraordinary culture of princely India, showcasing both Indian and western works that reflect different aspects of royal life. The exhibits include paintings, photography, textiles and dress, jewelry, jeweled objects, metalwork and furniture, and are explored within a broader historical context of princely life and ideals, patronage, court culture and alliances. Victoria and Albert Museum, **London**, through January 17.

**The World of Islam in the Collection of the Aga Khan Museum** exhibits more than 180 works of art in leather, stone, gold, bronze, ivory, glass, ceramic, textile, parchment and paper from the 14 centuries and the vast geographical span of the Islamic world. CaixaForum, **Barcelona**, through January 17.

**Ayşe Erkmen:** *Roommates* refers to the room under the museum's glass cupola, where she has inserted a modest but disconcerting element: Swags of blue-gray, umber and gold fabric swoop and step among the steel beams overhead, turning the space's outer skin into a visual topic and creating a transition zone between outside and inside in which her work lives. The Istanbul-born artist lives and works there and in Berlin, and all her work is site-specific. Kunstsammlung Nordrhein-Westfalen, **Düsseldorf, Germany**, through January 17.

**At the Court of the Grand Turk:** *The Caftans of Topkapı Palace* (part of "Turkish Season at the Louvre") shows caftans, jewelry and accessories worn by members of the Ottoman imperial family. Musée du Louvre, **Paris**, through January 18.

**From Izmir to Smyrna:** *The Discovery of an Ancient City* (part of "Turkish Season at the Louvre") displays samples of the artistic production of one of the most brilliant cities of the Ionian coast—Smyrna, today's Izmir—and its neighbors, Ephesus and Miletus, illustrating connections among studios that produced stone and terra-cotta sculpture in the region. Musée du Louvre, **Paris**, through January 18.

**Princely Tombs of Anatolia:** *Alaca Höyük in the Third Millennium* (part of "Turkish Season at the Louvre") demonstrates Bronze Age Anatolia's riches in such raw materials as gold, silver, copper and tin, and the consequent riches that local rulers, such as those of Troy, Arslan Tepe and Alaca Höyük, derived from trade. On display are gold vessels, jewels and bronze standards. Musée du Louvre, **Paris**, through January 18.

**Falnama:** *The Book of Omens* is the first exhibition ever devoted to a category of extraordinary illustrated texts known as *Falnama (Book[s] of Omens)*. Notable for their monumental size, brilliantly painted compositions and unusual subject matter, the manuscripts, created in Safavid Iran and Ottoman Turkey in the 16th and early 17th centuries, remain largely unpublished. Yet the art of divination was widely practiced throughout the Islamic world, and these texts were the most splendid tools ever devised to foretell the future. The exhibition sheds new light on their artistic, cultural and pious significance, displaying some 60 works of art on loan from international public and private collections. Catalog. Sackler Gallery, **Washington, D.C.**, through January 24.

**From Byzantium to Istanbul:** *One Port for Two Continents* presents around 300 objects from Turkish, French and international public collections that set out the successive stages of the long history of a city that has always been both a continental and maritime crossroads. The site has been occupied since Paleolithic times, when the Bosporus channeled large flows of migrants from the Balkans toward Anatolia, and the documented existence of a port for more than 8000 years marks the site as an important and prosperous trading point from earliest times. The economy and daily life of Byzantium were shaped by the city's topographical position; Roman occupation did not alter this, and after the city became Constantinople, its position as a commercial, political, military and religious center grew until the end of the Middle Ages. The exhibition also covers the changes made to the face of the city by Venetians and Genoese, by Mehmet the Conqueror and his successors and as a result of the slow and gradual integration of Istanbul into the West. Galeries nationales du Grand Palais, **Paris**, through January 25.

**Garden and Cosmos:** *The Royal Paintings of Jodhpur* features 56 paintings from India that reveal a unique art tradition of the royal courts between the 17th and 19th centuries. During this period, the region of Jodhpur, in modern-day Rajasthan, produced a distinctive and inventive painting style. Paintings produced for the private enjoyment of the maharaja and his court brought traditional Rajasthani styles together with styles developed in the imperial court of the Mughals. The paintings range from miniatures to monumental artworks depicting the palaces, wives and families of the Jodhpur rulers. Later works depict epic narratives and demonstrate the devotion of Maharaja Man Singh to an esoteric yogic tradition. Jodhpur artists rose to the challenge of creating images for metaphysical concepts and yoga narratives, which had never previously been the focus of the region's court art. Art Gallery of New South Wales, **Sydney, Australia**, through January 26.

**Indian Life and Landscape by Western Artists:** *Paintings and Drawings from the V&A 1790–1927* shows 94 works by 20 western artists drawn from the collection of the Victoria and Albert Museum that depict the architecture, landscape and people of India. Victoria Memorial Hall, **Kolkata, India**, through January 31; Salar Jung Museum, **Hyderabad, India**, February 13 through March 28.

**Beloved Daughters:** *Photographs by Fazal Sheikh* presents 70 intimate and revealing photographic portraits of women—widows, mothers and children—in India. Sheikh, born in New York, won a Macarthur Award in 2005. Museum of Photographic Arts, **San Diego, California**, through January 31.

**The Two Qalams:** *Islamic Arts of Pen and Brush.* In Arabic, the word *qalam* originally meant the calligrapher's reed pen. Calligraphers were and are esteemed in Islam because their pens write the sacred words of the Qur'an. The attitude toward painters, however, has not always been so positive since their brushes could depict—thus create—human and animal figures, thereby challenging the sole creative authority of God. Persian poets of the 16th century countered this negative perception by describing the painter's brush as a second *qalam*, equivalent to that of the calligrapher's pen. The two *qalams* came together in the vibrant bookmaking workshops of the Islamic courts of Persia and India where calligraphers and painters collaborated to produce a wealth of illustrated manuscripts and elaborate albums filled with specimens of beautiful writing and painting. As seen in the 16th- through 19th-century album pages in the exhibition, the arts of pen and brush often merged with exquisite results. **Philadelphia** Museum of Art, through January.



CURRENT **February**

**Genghis Khan and the Mongol Empire** features artifacts from the reign of the legendary leader, including a newly discovered mummy and tomb treasures. Genghis conquered an empire three times the size of Julius Caesar's or Alexander's, but also established national parks, a postal system and the concept of international law, and set the boundaries of some modern nations. His empire was the safest and most tolerant of lands. Approximately 200 artifacts are on display, including Mongolian costumes, headdresses and instruments from the National Museum of Mongolian History, and imperial gold, metal ornaments, beads and a tombstone from Russia's State Hermitage Museum. **Denver [Colorado]** Museum of Nature and Science, through February 7.

**The Silk Road:** *A Trip Through Life and Death* tells the story of the great cultural and technological exchanges that took place 2000 years ago along the Silk Roads. Silk and other luxury products were not the only goods traded: Ideas, technologies and religions were also exchanged by merchants, craftsmen and soldiers. Europe learned about silk, paper, printing and porcelain from China; China acquired horsemanship, Buddhism, glassworking and silver- and goldsmithing. Visitors will take part in a historical and geographic voyage: The first dealing with the rise of the Silk Roads, Chinese efforts to control traffic along them and their resurgence in modern times. In the geographical voyage, the visitor will "travel" westward from Xi'an across passes, deserts, mountains and steppes to Kashgar. Musée du Cinquantenaire, **Brussels**, through February 7.

**Heroes and Villains:** *The Battle for Good in India's Comics* examines the legacy of heroes and heroines of ancient Indian mythology in contemporary South Asian culture through the comic-book genre, which can be understood as an ongoing dialogue between American and South Asian visual culture. The exhibition presents a selection of vintage Indian and American comics and contemporary pencil-and-ink–drawn character explorations from the current Virgin Comic series *Ramayan* and *Devi*, as well as a selection of historical Indian court paintings, underlining the continuity of the heroic narrative tradition in Indian art. Approximately 57 works will be on view in addition to an on-screen display showing the multilayered process of comic-book production. **Los Angeles** County Museum of Art, through February 7.

**Fabled Fabrics:** *Ottoman Textiles in the MAK* presents artful embroidery from the 16th and 17th centuries, decorative scarves or turban wraps with intricate embroidery, lavishly patterned silk fabrics and an example of 18th-century silk ceremonial clothing with subtle embroidery. Some of the fabrics for domestic—though not everyday—use, such as napkins, hand towels, sashes, cushion cases, draperies and blankets, have not been exhibited before. Not all the textiles shown originated within the Ottoman Empire: some come from European regions that the dynasty brought under its control for shorter or longer periods, including Greece, Romania, Bulgaria, Hungary, Serbia, Armenia and, very nearly, Austria. Museum für Angewandte Kunst, **Vienna**, through February 7.

**Silk, Gold, Kermes:** *Secrets and Technology at the Visconti and Sforza Courts* displays the outstanding artistic and technical quality of the silk industry's products in the second half of the 15th century. About 50 objects–velvet and damask textiles, mostly brocaded with gold and silver; embroidery with gold and pearls; playing cards; illuminated manuscripts and paintings—illustrate the link between lavishness and technology in Milanese production. The exhibition presents the cultural and social background of the Visconti and Sforza court and the features of a town that enabled it to encourage and attract skilled workers as well as to develop new technologies. Kermes—cochineal—is a red dye made of certain insects; it was prized for its countless nuances of color, and it was extensively traded from Baghdad to the Black Sea. Museo Poldi Pezzoli, **Milan**, through February 21.

**Alexander the Great and the Opening of the World:** *Asia's Cultures in Transition* follows the conqueror through Central Asia and focuses on the extensive cultural, economic and social changes unleashed by his passage. The exhibition includes objects lent by Uzbek museums (Samarkand, Tashkent and Termes) and the Tajikistan's National Museum of Antiquity as well as the Louvre, the British Museum and the Berlin Museums. Reiss-Engelhorn Museums, **Mannheim, Germany**, through February 21.

**An Enduring Motif:** *The Pomegranate in Textiles* presents a cross-section of textiles from the museum's collection that feature this richly symbolic fruit. Originating in Persia several thousand years ago, the pomegranate has been revered for centuries as a symbol of health, fertility and resurrection. Ancient Egyptians were buried with pomegranates in hopes of a second life. In Greek mythology, the fruit is associated with Persephone. Judaism esteems the pomegranate as a symbol of righteousness and fruitfulness. In Christianity, representations of pomegranates are often woven into fabrics used for church vestments and hangings. Islam's four gardens of paradise—described in the Qur'an—contain pomegranates, and according to Islamic legend, each fruit contains one seed that has descended from paradise. Buddhists view pomegranates as one of three blessed fruits. **Philadelphia** Museum of Art, through February 21.

**Breathing Ashes Through Skirmishes and Clashes.** Tarek Abu Hageb lives and works in Basel. Known first as a graffiti artist and hip-hop musician, he has created a highly individual style over the last few years through his strong interest in color and form, traditional abstract painting and the use of divergent techniques. His artistic production confronts the challenges of real life, with figurative scenes invading his compositions. Ramada Plaza **Basel, Switzerland**, through February 28.

**Splendor of Damascus:** *Textiles and Artifacts of Traditional Syria* presents colorful, hand-embroidered dresses from late 19th- and early 20th-century Syria, on exhibit for the first time in North America: from elegant gold-embroidered purple velvet wedding attire from Damascus to the colorful, cross-stitched dresses and scarves of rural areas. The exhibit also features antique jewelry, brasswork and inlaid wood furniture of the region, as well as items from the museum's permanent collection. Antiochian Heritage Museum, **Ligonier, Pennsylvania**, through February.

CURRENT **March**

**OnLAB** is a meditation on the relationship between the original and the copy, the object and its virtual image, that illuminates the rediscovery of ancient works, the use of new technology to study them and their popularization in today's culture. Working at the intersection of art and science, Michel Paysant and staff scientists and conservators of French museums have created a *modello* four meters long of one of the Louvre's tiniest sculptures, a Mesopotamian cylinder seal, as well as micro- and nano-sculptures related to it. Maps, photographs and scans take the examination deeper. Musée du Louvre, **Paris**, through March 1.

**The Light of Kairouan** spans the first five centuries of the Islamic era, the pinnacle of the Kairouan civilization whose influence expanded from present-day Tunisia throughout the western Mediterranean. A sumptuous collection of richly embellished Qur'anic and jurisprudential manuscripts emphasizes the city's long pioneering role in the establishment of the Qur'an's canonical text and in the refinement of Arabic writing. The exhibition also includes specimens of Kairouan ceramics that illustrate the brilliance of Ifriqiyyan art and its talent for synthesis of eastern and local styles, as well as jewelry, marble and bronze objects and archeological artifacts that refute the contention that figurative representation in art was banished from the beginning of the Islamic era. The exhibits demonstrate that Kairouan, a link between the Muslim West and East, succeeded in developing its own artistic style and its own personality. Institut du Monde Arabe, **Paris**, through March 7.

**Enamels of the World, 1700–2000** features some 320 pieces in the inaugural presentation of a remarkable new facet of the Khalili Collections, now best known for their Islamic art. The collection views the subject in a global context rather than within the confines of national boundaries or individual activity, and the overview focuses on enamelwork of the past 300 years, encompassing objects produced in all the major centers of the art, including the Islamic lands. The richness of the collection also ensures that the work of individual enamellers may be studied in detail. Tickets: www.hermitagemuseum.org. State Hermitage Museum, **St. Petersburg, Russia**, through March 14.

**Arts of Islam:** *Treasures from the Nasser D Khalili Collection* presents nearly 500 objects from the world's most comprehensive Islamic-art collection: manuscripts, paintings, rugs, ceramics and glassware, metalwork, jewelry, lacquerwork and works in wood and stone. The exhibition is organized under three themes: "Faith, Wisdom and Fate" deals with the relationship between art and the sacred; "Patronage" reflects the development of court arts, whose influence spread into broader society; and "A Universe of Forms and Colors" explores the burgeoning of creation for the sake of sensory delight, a foretaste of paradise. Institut du Monde Arabe, **Paris**, through March 14.

**Connecting Communities** is a multimedia exhibition that lets Arab, Latino, Southeast Asian and Eastern European immigrants tell their own stories, which often contradict common stereotypes. Photos, personal objects and texts further illuminate the immigrant experience. Arab American National Museum, **Dearborn, Michigan**, through March 28.

**Afghanistan:** *Hidden Treasures from the National Museum, Kabul* explores the cultural heritage of ancient Afghanistan from the Bronze Age (2500 BC) through the rise of trade along the Silk Roads in the first century of our era. Among the nearly 230 works on view, all from the National Museum of Afghanistan in Kabul, are artifacts as old as 4000 years, as well as gold objects from the famed Bactrian Hoard, a 2000-year-old treasure of Bactrian grave goods excavated at Tillya Tepe in 1978 and long thought to have been stolen or destroyed, but rediscovered in 2003. The earliest objects in the exhibition, from Tepe Fullol in northern Afghanistan, are fragmentary gold vases dated between 2500 and 2200 BC. A second group, from the former Greek city Aï Khanum, reflects Mediterranean influence between the fourth and second centuries BC. Trade goods from a third site, at Begram, date from the first century and include ivory statues and reliefs, as well as painted glassware, vases and bronzes, many imported from Roman, Indian, Chinese and East Asian markets. The Tillya Tepe group consists of some 100 first-century gold objects, including an exquisite crown and necklaces, belts, rings and headdresses. Canadian Museum of Civilization, **Ottawa**, through March 28; Kunst- und Ausstellungshalle der Bundesrepublik Deutschland, **Bonn**, June 11 through October 3; British Museum, **London**, Spring 2011.

**Tutankhamun and the Golden Age of the Pharaohs** includes 130 works from the Egyptian National Museum, among them a selection of 50 spectacular objects excavated from the tomb of Tutankhamun, including one of the canopic coffinettes, inlaid with gold and

precious stones, that contained his mummified internal organs. An additional 70 pieces in the exhibition derive from the tombs of royalty and high officials of the 18th Dynasty, primarily from the Valley of the Kings. These additional works place the unique finds from the tomb of Tutankhamun into context and illustrate the wealth and development of Egyptian burial practice during the New Kingdom. The exhibition is more than twice the size of the 1979 "King Tut" exhibition and is on an "encore tour" of US museums. Tickets: +1-877-888-8587. De Young Museum, **San Francisco**, through March 28.

CURRENT **April**

**The Egypt of Gustave Flaubert** combines extracts from the 19th-century French writer's letters and travel diaries with the cool and precise photographs made by his friend and fellow traveler Maxime du Camp during their exploration of Egypt from Alexandria to Giza to Abu Simbel in 1849 and 1850. Along with these documents, the exhibition includes some 100 archeological objects, including pharaonic portraits, tomb paintings, crocodile mummies and other items that Flaubert and du Camp encountered on their travels. Texts and photographs together constitute a typical view of Egypt through the eyes of two young Europeans. Flaubert was then a beginning writer—*Madame Bovary* lay eight years in the future—and du Camp was skillfully using technology that was less than 10 years old. Rijksmuseum van Oudheiden, **Leiden, The Netherlands**, through April 4.

**Quest for Immortality:** *The World of Ancient Egypt* offers insight into the ancient Egyptians' attitude to life and the afterlife, and the preparations they made to ensure their transition from earthly existence to immortality. With 230 artifacts spanning from 4000 BC to 950 of our era, the exhibition places tomb objects in their social, religious and artistic context, demonstrating the diversity and adaptability of an art that has prevailed in both time and space. The ancient Egyptian world is often characterized by a fascinating and remarkably supple mental universe. Ancient Egyptians melded images in ways that often beggar our logic. They linked material elements with a realm inaccessible to humans, as reflected both in their daily conduct and their emphasis on the afterlife that led to their quest for immortality. National Museum of **Singapore**, through April 4.

**Oman** focuses on the country's role as a seafaring nation and its central location on international trade routes, such as that of the Dutch East India Company (VOC), presenting more than 300 outstanding items from different public and private museum collections in Oman and from international institutions. Oman is determined to preserve its cultural heritage while modernizing, and its history is illustrated by a wealth of superb, unique artifacts. The exhibition presents a picture of the country's remarkable cultural traditions. De Nieuwe Kerk, **Amsterdam**, through April 18.

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# Mercenaries and Turks: *Recovered Treasure from the German Renaissance*

presents two extraordinary series of colored woodcuts. One shows Swiss and German mercenaries; the other is of great cultural-historical value and shows Turkish soldiers mounted on horses and camels. Museum Boijmans van Beuningen, **Rotterdam**, through March 7.

**Erhard Schön, "Turkish Soldier on a Dromedary," ca. 1530. Woodcut with added watercolor, 31 x 20 cm, private collection. The inscription reads, "An image of the camel-animal that carries the Turk into battle....There are many of this animal in his country....It has a hump on its back, on which a true Mamluk is sitting."**

**Tutankhamun: The Golden King and the Great Pharaohs** is [another] extensive exhibition of more than 140 treasures from the tomb of the celebrated pharaoh and other sites. It includes his golden sandals, created specifically for the afterlife and found on his feet when his mummy was unwrapped; one of the gold canopic coffinettes, inlaid with jewels, that contained his mummified internal organs; and a three-meter figure depicting Tutankhamun as a young man, which originally may have stood at his mortuary temple. Providing context and additional information are 75 objects from other tombs in the Valley of the Kings, including objects related to Khefren (Cheops), Hatshepsut and Psusennes. ⓘ Art Gallery of Ontario, **Toronto**, through April 18; **Denver [Colorado]** Art Museum, from July 10.

CURRENT **May**

**Visions of the Cosmos:** *From Milky Ocean to Black Hole* spans history, geography and religion to examine the ways in which different cultures view their place in the universe. Visitors will encounter eastern and western perspectives of the cosmos, along with photographs representing current astrophysical findings and a virtual trip through the universe. Rubin Museum of Art, **New York**, through May 10.

**The Secrets of Tomb 10A:** *Egypt 2000 BC* introduces the concepts of the afterlife in the Middle Kingdom (2040–1640 BC) by a journey through the remarkable tomb of Djehutynakht and its many objects. In a 1915 excavation, the MFA found, in jumbled disarray, the largest Middle Kingdom burial assemblage ever discovered. The tomb was filled with the funerary equipment of a local governor and his wife, and contained four beautifully painted coffins, one of which may be the finest painted coffin Egypt produced and a masterpiece of panel painting. Additionally, it included Djehutynakht's jewelry, walking sticks, canopic jars and other objects, plus models of what must have been the governor's estate, including some 60 different model boats and two dozen models of daily life, such as individual shops of carpenters, weavers, brick-makers, bakers and brewers. Most of the objects have never been displayed before. Museum of Fine Arts, **Boston**, through May 16.

**Gold of the Steppes:** *Princely Treasures From Beyond Alexander's Empire* displays unique artifacts created by the Scythians and Sarmatians, horse nomads who left no written records but did leave exquisite material evidence of very highly developed cultures. More than 200 exhibits illuminate their traditions, richness and artistic talents, and display the results of the excavations of recent decades. Reiss-Engelhorn Museums, **Mannheim, Germany**, through May 25.

CURRENT **June**

**The Manchester Indian:** *Thomas Wardle and India* shows scintillating silk saris and other textiles from India, and marks the centenary of the death of Thomas Wardle. Best known for his collaboration with William Morris, Wardle also made great efforts to reinvigorate the silk industry in India. During a visit there in 1885–1886 he collected sample lengths of fabric, which are featured in the exhibition together with fabrics printed and dyed by Wardle's company in Staffordshire, and which reveal the profound influence of Indian design on British textiles of the Arts and Crafts movement. Whitworth Art Gallery, University of **Manchester, UK**, until Summer.

**Childhood on the River Nile:** *Images of Children from Egypt* displays children's clothing, shoes and toys; doll clothing; depictions of children on the ornamental trimmings of fabrics and other organic artifacts. Bode-Museum, **Berlin**, through June 10.

**Terracotta** displays some 100 objects, including delicate Greek female figurines, architectural fragments, medieval children's toys, prehistoric animal figures and sculptures of deities from pre-Islamic Syria and Iraq. Terra-cotta sculptures served different purposes in different cultures—sometimes representing gifts to the gods or fertility symbols—and thus provide information on religious practices, burial customs, clothing and household objects in the time and place they were made. The exhibition emphasizes the techniques used and the craftsmanship that went into making the objects. Rijksmuseum van Oudheiden, **Leiden, The Netherlands**, through June 13.

CURRENT **July and Later**

**Arts of Bengal:** *Wives, Mothers, Goddesses* presents domestic artifacts made by and for Bengali women during the 19th and 20th centuries, including intricate embroidered quilts called *kanthas*, vibrant ritual paintings and fish-shaped caskets and other implements created in a resin-thread technique. Drawn from a common pool of motifs and ideas that reflect the unique environment of the region, these creations provide a rare view into women's everyday lives and thoughts. Other arts, such as elaborate painted narrative scrolls and souvenir paintings from Kalighat near Calcutta, illustrate women's many roles, both domestic and divine. (A companion exhibition, **Arts of Bengal: Village, Town, Temple**, open from March 13 through July, also showcases works from the Museum's extensive holdings of Bengali vernacular arts.) **Philadelphia** Museum of Art, through July.

**Kantha:** *The Embroidered Quilts of Bengal.* Stitching *kanthas* was an art practiced by women across Bengal, a region today comprising the nation of Bangladesh and the state of West Bengal, India. Lovingly created from the remnants of worn garments, kanthas are embroidered with motifs and tales drawn from a rich local repertoire and used especially in the celebration of births, weddings and other family occasions. The exhibition presents some 40 examples created during the 19th century and the first half of the 20th, when this vibrant domestic art flourished, and encompasses works by women of diverse backgrounds—rural and urban, Hindu and Muslim. While all share a collective Bengali culture, the amazing variety of motifs, patterns, color combinations and designs of the kanthas demonstrates the imagination and creativity of their makers. **Philadelphia** Museum of Art, through July.

MUSEUM BOIJMANS VAN BEUNINGEN

**Very Postmortem:** *Mummies and Medicine* explores the modern scientific examination of mummies that has provided new insights into Egyptians' living conditions and brought us closer to understanding who they were. The exhibition marks the return of Irethorrou, the Fine Arts Museums' mummy out on loan since 1944. CT-scans done at Stanford University Medical School shed light on Irethorrou's physical attributes and the cause of his death, and make possible a three-dimensional "fly through" of the mummy and a forensic reconstruction of his head. The exhibition also includes a variety of ancient artifacts that date from approximately 664–525 BC, the Late Period of the 26th Saite Dynasty. Fine Arts Museums Legion of Honor, **San Francisco**, through August 15.

**Bharat Ratna!** *Jewels of Modern Indian Art* presents a selection of outstanding works by some of India's most celebrated modern painters, focusing on a generation that emerged following India's independence in 1947. Luminaries such as Francis Newton Souza, Maqbool Fida Husain and Sayed Haider Raza formed an influential artistic avant-garde at this transitional moment; their paintings are a synthesis of visual traditions, embracing both western modernism and a heritage colored by Indian art, myths and classical traditions. The exhibition's divergent works highlight the dialogue between the traditional and modern, the indigenous and foreign and the sacred and secular as Indian artists sought an independent identity. Museum of Fine Arts, **Boston**, through August 22.

**Pioneers to the Past:** *American Archaeologists in the Middle East, 1919–1920* highlights James Henry Breasted's travels through Egypt, Mesopotamia, Syria and Palestine, exhibiting travel ephemera, documents and archival photos, narrated by quotations from diaries. Breasted's goal was to purchase artifacts for his new Oriental Institute Museum and to scout sites for future excavation, but he found himself in the unstable political situation after World War I, when local peoples, under colonial domination, were struggling for independence. The exhibition raises questions about whose history would be written, the role of America in the Middle East and the relationship of the past to the present—all issues still debated today. Catalog. Oriental Institute Museum, **Chicago**, through August 31.

COMING **January**

**Mind the Dig!** *How Does Archeology Work?* An interactive exhibition. Reiss-Engelhorn Museums, **Mannheim, Germany**, January 17 through September 19.

COMING **February**

**Breaking the Veils** is a selection of work by 51well-established female artists—some veiled, some not—from Sudan, Malaysia, Turkey, Iran and Pakistan, as well as the Levant, the Gulf states and North Africa. The art, from the collection of the Royal Society of Fine Arts of Jordan, is a visually and intellectually engaging collection designed to challenge tiresome stereotypes and enliven popular and academic discourse on women and the arts in the Islamic world. Murphy Gallery, St. Catherine University, **St. Paul, Minnesota**, February 2 through April 1.

**To Live Forever:** *Egyptian Treasures from the Brooklyn Museum* uses some 120 pieces of jewelry, statues, coffins and vessels dating from 3600 BC to the year 400 of our era to illustrate the range of strategies and preparations that the ancient Egyptians developed to defeat death and to achieve success in the afterlife. The exhibition explores the belief that death was an enemy that could be vanquished, a primary cultural tenet of ancient Egyptian civilization. To survive in the next world, Egyptians would purchase, trade or even reuse a variety of protective objects. The exhibition explains the process of mummification, the economics and rituals of memorials, the contents of the tomb, the funeral accessories—differentiated by the class of the deceased—and the idealized afterlife. Exhibits include the vividly painted coffin of a mayor of Thebes, mummies, stone statues, gold jewelry, amulets and canopic jars. Catalog by curator Edward Bleiberg, $39.95. **Brooklyn [New York]** Museum, February 12 through May 2; Philbrook Museum of Art, **Tulsa, Oklahoma**, June 6 through September 12.

COMING **March**

**Poetry and Prayer:** *Illuminated Manuscripts from the Islamic World* presents masterpieces of Islamic manuscript illumination from the ninth to the 19th century created in famed artistic centers in today's Iraq, Iran, Turkey, Egypt and the Indian subcontinent. Characterized by the effects of gold, lapis lazuli and esthetically powerful design, Islamic manuscript illumination enhances the viewer's engagement with the book. The exhibition aims to broaden the perspective on Islamic illumination by considering both religious and non-religious works and to explore the ways in which illumination punctuates various parts of the book, navigating the reader through the pages. Walters Art Museum, **Baltimore**, March 20 through June 13.

**Meroë:** *Empire on the Nile* is the museum's first exhibition about the capital city of a majestic and enigmatic civilization that developed on the banks of the Nile between 270 BC and 350 of our era. It includes 200 works, which reveal Meroë's multicultural character. Musée du Louvre, **Paris**, March 26 through September 6.

COMING **April**

**The Seventh International Congress on the Archaeology of the Ancient Near East**, the major international forum for Near Eastern archeology, will be hosted jointly by the British Museum and University College London. ICAANE is held every two years in a different country and attracts 600 to 700 participants each year. ⓘ www.7icaane.org or admin@7icaane.org. **London**, April 12–16.

COMING **May**

**Treasures of the World:** *Jewellery of India Under the Grand Moguls* includes more than 400 pieces of jewelry from the Mughal epoch, lent by the Al-Sabah family, which constitute the core of one of the great Islamic art collections of the late 20th century. The 13 sections of the exhibition not only display those amazing and in some cases unique works but also inform the viewer about materials and techniques. Islamic Arts Museum **Malaysia, Kuala Lumpur**, July 28 through mid-December.

COMING **June**

**Muraqqa':** *Imperial Mughal Albums from the Chester Beatty Library* focuses on a group of six albums (*muraqqa's*) compiled in India between about 1600 and 1658 for the Mughal emperors Jahangir and Shah Jahan (builder of the Taj Mahal). Each album folio originally consisted of a painting on one side and a panel of calligraphy on the other, all set within beautifully illuminated borders. Many of the paintings are exquisitely rendered portraits of emperors, princes and courtiers—all dressed in the finest textiles and jewels—but there are also images of court life, and of Sufis, saints and animals. This exhibition has been on tour in the us for the past year and will now return to the Library, which holds one of the finest collections of Indian Mughal paintings in existence. Catalogue. Chester Beatty Library, **Dublin**, June through October.

**Document:** *Iranian-Americans in Los Angeles.* Four documentary photographers—Farhad Parsa, Arash Saedinia, Parisa Taghizadeh and Ramin Talaei—focus their lenses on second-generation Iranian–Americans of Los Angeles over a four-month period, October 2009–January 2010. The results consider the everyday lives of the subjects, as well as the photographers' experiences of the process of documentation and how it informed their understandings of their own hyphenated Iranian identities. Fowler Museum at UCLA, **Los Angeles**, June 6 through August 22.

**PERMANENT**

**The Saudi Aramco Exhibit** relates the heritage of Arab-Islamic scientists and scholars of the past to the technology of today's petroleum exploration, production and transportation, set against the background of the natural history of Saudi Arabia. **Dhahran, Saudi Arabia**.

*Information is correct at press time, but please reconfirm dates and times before traveling. Most institutions listed have further information available at their Web sites. Readers are welcome to submit information for possible inclusion in this listing. Some listings have been kindly provided to us by* Canvas, *the art and culture magazine for the Middle East and the Arab world.*

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