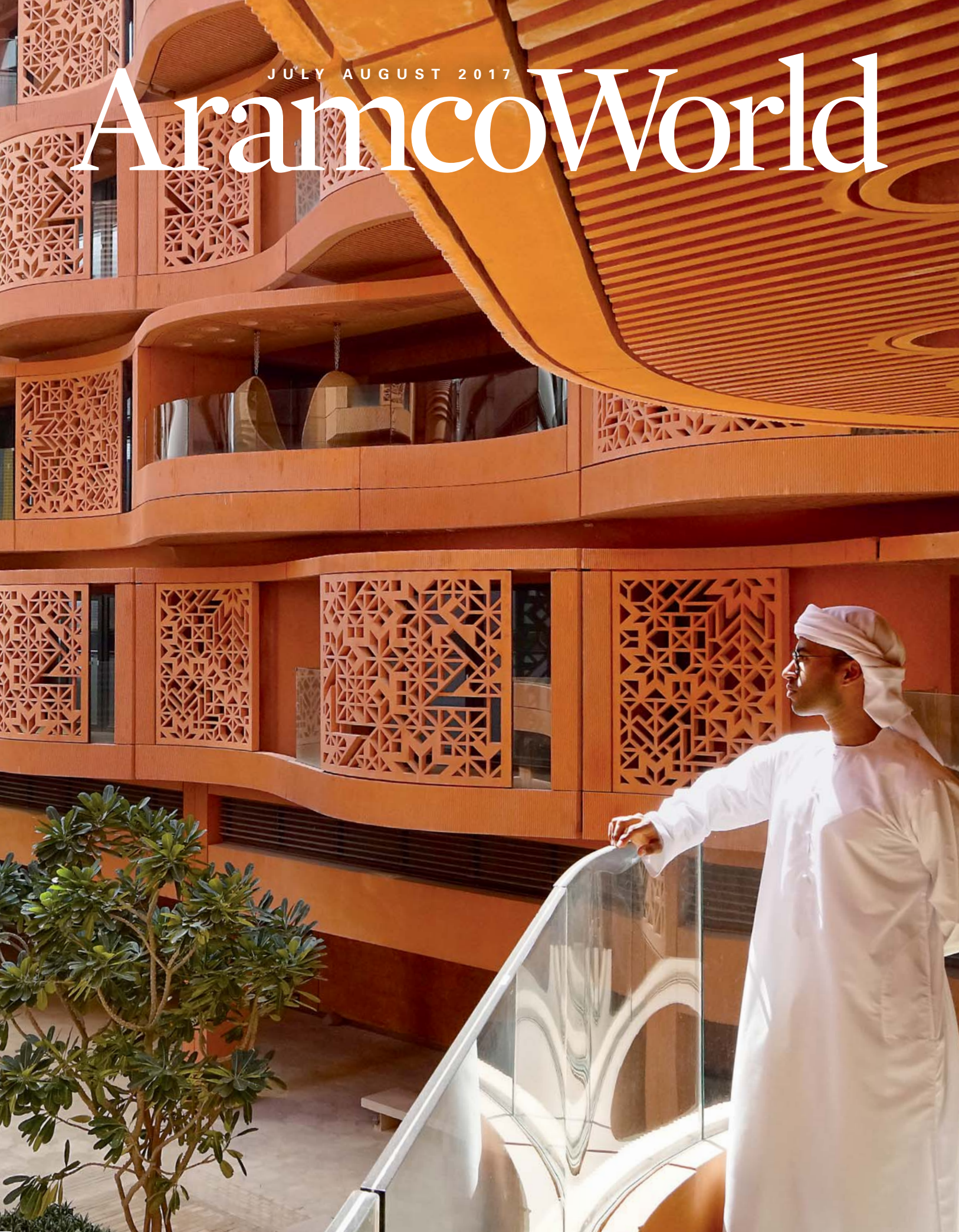


JULY AUGUST 2017

# AramcoWorld





## 4 Hadrian's Syrians

*Written by Charles O. Cecil*

Stretching 80 Roman miles across northern England, Hadrian's Wall took 8,000 men to supply, maintain and defend. Among them were some 500 archers recruited from Syria for their skill with composite bows. With them came merchants, too, including one named Barates, who married a local woman, Regina. When she died, he expressed his bereavement on stone, leaving us a glimpse of daily life along Hadrian's Wall.

## 10 Chasing Zero

*Written by Alan Mammoser*

*Photographed by Kevin Bubriski*

A few kilometers east of downtown Abu Dhabi, traditional Arab urban principles are informing high-tech construction at Masdar City, one of the world's most complex experiments in urban sustainability. Planned a decade ago to replace every molecule of carbon energy it used with one or more new ones, Masdar City is adapting its aspirations to financial necessities while evolving into a leading laboratory at the congested intersection of energy, environment, economics and design.

 [Online CLASSROOM GUIDE](#)

 [2 FIRSTLOOK](#) *Photograph by Lorraine Chittock*

# AramcoWorld

[aramcoworld.com](http://aramcoworld.com)

July/August 2017  
Vol. 68, No. 4



We distribute *AramcoWorld* in print and online to increase cross-cultural understanding by broadening knowledge of the histories, cultures and geography of the Arab and Muslim worlds and their global connections.

**Front Cover:** A room with a view of the future is how engineering research assistant Abdulrahman Alzaabi sees his Masdar City residence, which uses 60 percent less energy than a conventional one. "Simply to paint a scenario of what a 100 percent renewable energy portfolio would look like for the country," he says, "is a way of recognizing our interest in sustainability." Photo by Kevin Bubriski.

**Back Cover:** A staircase in Masdar Institute blends sleek design with the thermal mass of concrete, which helps keep temperatures stable. Photo by Kevin Bubriski.



## 22 The White Olives of Malta

*Written and photographed by Tom Verde*

In the Middle Ages, *bajda* olives—from the Arabic for “white”—were prized on this Mediterranean archipelago, but by the late 20th century they were nearly gone. It took a retired expert in gems and jewels to revive the olives knights once called “Maltese pearls.”

## 28 Why Reinvent the Wheel?

*Written by Graham Chandler  
Illustrated by Ivy Johnson*

It may be an all-around symbol of human progress, but we still aren’t sure who actually invented it—Mesopotamians or Europeans? We don’t know for sure what the first ones were used for. We don’t know why so many people were so slow to adopt it. (How did such a simple invention cause so much controversy?)

## 34 eL Seed’s New Scripts

*Written by Johnny Hanson*

Fluid, colorful and often covering buildings, eL Seed’s public installations of “calligrafitti” have won eyes and hearts in 14 countries. Now he’s embracing sculpture and fashion, but when asked what’s the most important thing about his art, he replies, “Meeting people.”

 38 REVIEWS & RECOMMENDATIONS

 40 EVENTS & EXHIBITIONS

Publisher: Aramco Services Company | President: Basil A. Abul-Hamayel | Director, Public Affairs: Jamal K. Khudair | Editor: Richard Doughty | Assistant Editors: Arthur P. Clark, Alva Robinson | Digital Media Editor: Johnny Hanson | Circulation: Melissa Altman | Administration: Michelle Flores | Print Design: Graphic Engine Design Studio | Printer: RR Donnelley/Wetmore | Web Design: eSiteful Corporation | Tablet Design and Mobile App: Herring Design

Subscriptions: [www.aramcoworld.com](http://www.aramcoworld.com) | Editorial: [editor@aramcoservices.com](mailto:editor@aramcoservices.com)

Mail: *AramcoWorld*, Post Office Box 2106, Houston, Texas 77252-2106 USA

ISSN: 1530-5821

4: CHARLES O. CECIL; 34: JOHNNY HANSON

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# FIRSTLOOK

## Cairo Cat

*Photograph by  
Lorraine Chittock*

In any town or city, there are always plenty of reminders that we humans are not the only inhabitants. This is particularly true in Cairo, thanks in great part to cats, who seem to pad and paw their way everywhere. And they have been doing this in Egypt since Pharaonic times, when they were mummified and solemnly interred by the thousands, and the goddess Bastet was depicted first as a lioness and, later, as a domestic cat. Cats have appeared in Egyptian iconography, poetry and literature for millennia, up to modern times.

This tabby, who frequented a tourist shop near Fishawi's Café, a favorite of Nobel Prize-winning author Naguib Mahfouz, acted like she knew all this history by heart. As she pranced over the souvenir sphinxes, Nefertitis and Tuts, I could sense her almost demanding her portrait be taken. I complied. She stared down the camera as if she had been studying the stone faces around her all her life.

—Lorraine Chittock  
[www.CairoCats.com](http://www.CairoCats.com)



# HADRIAN'S SYRIANS

Written by CHARLES O. CECIL



On display in the Arbeia Roman Fort and Museum in the coastal town of South Shields, at the mouth of the River Tyne, some 300 kilometers north of Manchester, England, is a tombstone relief showing a seated, robed woman, her face worn or chiseled away. Discovered in 1878 and dated to the late second century CE, the lady appears to be of stature in her time: her robe is long and fine, and she is adorned with a necklace and bracelets. In her lap, she holds a spindle of wool, and by her side sit spheres of yarn. Her right hand opens a jewelry box. At nearly a meter tall, it was a costly *memento mori*. Below her image is a formulaic Latin inscription that uses common abbreviations. And then, if one looks closely, there is more. At the very bottom, almost like a postscript, appears a series of finely incised letters: *RGYN' BT HRY BR'T' HBL*. These are not Latin. Indeed, it takes a specialist in the Western

Aramaic-based script of Palmyra, Syria, to translate it: “Regina, the freedwoman of Barates, alas.”

Judith Weingarten, an archeologist and scholar of Palmyrene history and culture at the British School at Athens, notes, “This is a typical Palmyran formula for the dead: name + descent or description + lament.” On Regina’s stone, she points out, the Palmyrene script is more grammatical and expertly carved than the Latin. This and the generally Palmyrene style of the monument suggest that the sculptor may have been a Syrian. But who did Barates think would read it?

At the time he commissioned Regina’s tombstone, there were some 500 archers from Hama, Syria, serving the Roman army in northern Britannia, less than 80 kilometers from Regina’s resting place. The Roman fort at South Shields—then called Lugudunum—guarded the primary port of entry for men and supplies heading to the network of forts and watchtowers along Hadrian’s Wall, which defined

Once a station for soldiers and sentries, the excavated ruins of milecastle 39 now beckon hikers roughly midway along Hadrian's Wall in Northumberland, England. From the early second century, the east-to-west wall separated Roman Britannia from Pictish tribes in Caledonia (in present-day Scotland) to the north. Not only stones did the work: Up to 8,000 men from all parts of the Roman Empire guarded and maintained the fortification along its 118-kilometer length. They included Syrians, as evidenced in the bilingual inscriptions—in Latin and Palmyrene—at the base of the tombstone found near South Shields, *lower*, a commemoration of 30-year-old Regina, from central Britannia, by her bereaved husband, Barates, from Palmyra.

the northern edges of Roman rule. It is thus quite possible that Syrian archers passed this way en route to and from their duty posts along the wall.

David Devine, author of *Hadrian's Wall: The Northwest Frontier of Rome* (1995), calls the wall “the greatest surviving monument to the military power of Rome.” Having first conquered Britain—Britannia in Latin—in 43 CE, Rome extended its control northward. Nearly a century later in 122 CE, Emperor Hadrian came to inspect these northern holdings. More a consolidator than an expansionist, Hadrian was concerned that the empire was overextended in some areas and, as a result of his visit to northern Britannia, ordered a wall be built from coast to coast to delimit the empire's northern reach.

The stone barricade took six years to build, and it stretched 118 kilometers from near today's Newcastle upon Tyne west to Carlisle. Several Roman forts already existed along this route, and the wall passed near them or, in some cases, intersected them. “Mile-castles”—small guard stations spaced apart by a Roman mile (1.48 km)—fortified the wall, and two watchtowers or turrets were built at intermediate points between each. The wall



TO THE SPIRITS OF THE DEPARTED [AND TO] REGINA, HIS FREEDWOMAN AND WIFE  
 BARATES OF PALMYRA [ERECTED THIS]  
 [SHE] A CATUVELLAUNIAN [BY TRIBE], AGED 30

REGINA, THE FREEDWOMAN OF BARATES, ALAS

rose four and one-half meters, and a deep ditch along its north side made assault even more difficult.

The Romans, however, did not design the wall so much for defense as for surveillance. The walkway along the top was not wide enough to serve as an effective fighting platform, but it did provide a vantage point from which to spot potentially hostile forces in the distance. This early warning allowed Roman forces to pass through the gates in the wall to engage enemies according to preferences of Roman military doctrine: in the open field. In central portions along the route, where even the terrain itself would make assault almost impossible, the wall nevertheless continued unbroken, sometimes on the edges of high escarpments. It was thus more of a political than a military statement: “Here Roman rule stops. North of this point, we have no responsibility.” Of course, the wall also served to control the flow of people as well as valuable—taxable—commerce.

Curiously, in Rome there exists no contemporary written reference to the wall. The

only known reference to Hadrian's decision to build it is a single sentence in a work by the Roman historian Spartianus.



Left: Hadrian's Wall belted Britannia between what is now South Shields and Carlisle; the later Antonine Wall was about half the length of Hadrian's. Syrian archers served at both. Lower: In this artist's conception of a Roman fort bestriding Hadrian's Wall along the River Tyne, fields and granaries outside the garrison hint at how Romans and locals may have mixed.

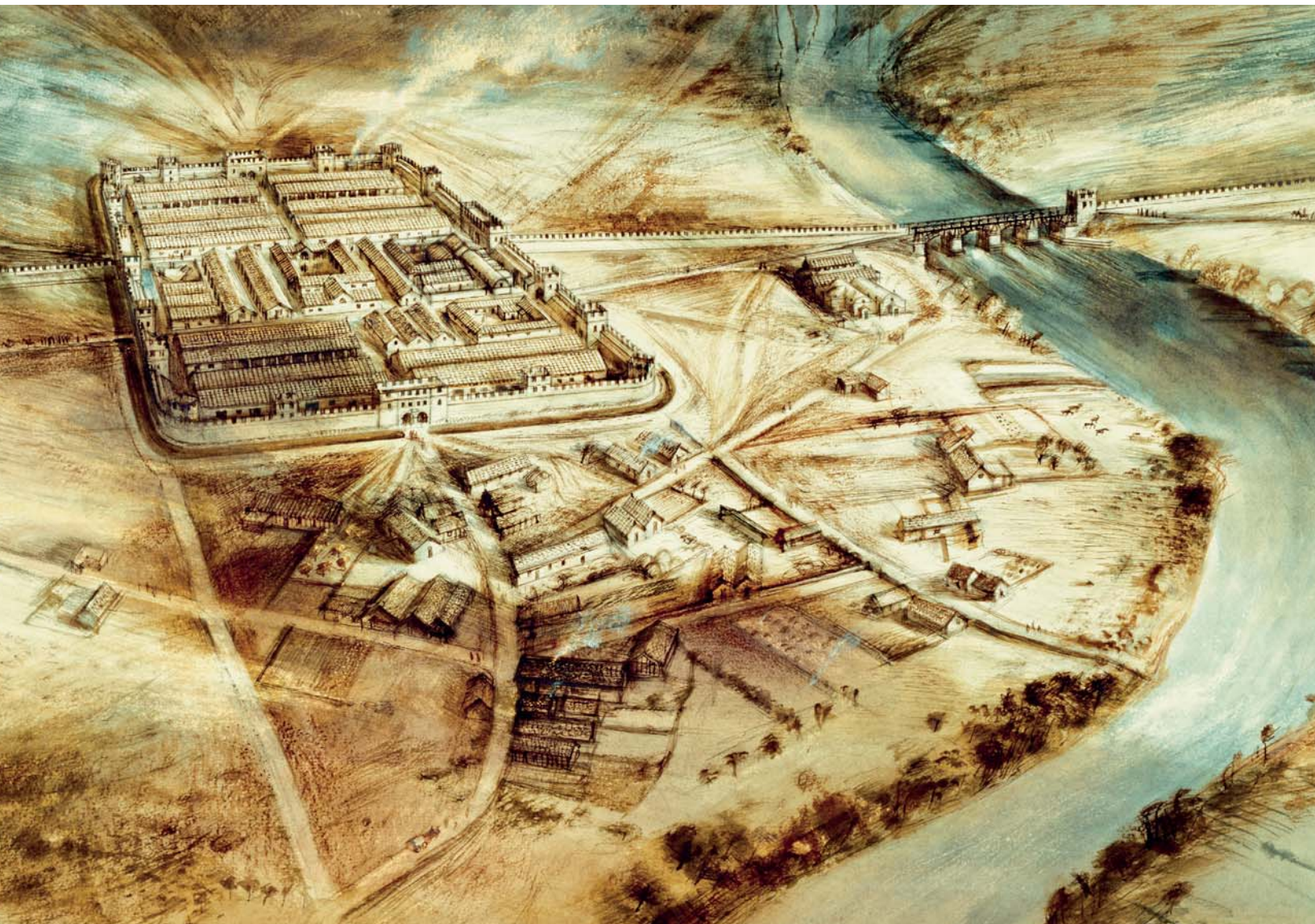


Expounding on Hadrian's visit to Britain more than a century and a half after it took place, the historian wrote, "He was the first to construct a wall, eighty [Roman] miles in length, which was to separate the barbarians from the Romans."

Today, most of what we know about the wall comes from archeology. One such find includes the earliest evidence of a Syrian presence in the region: a "diploma," or discharge from military service, dated July 17, 122 CE, that entitled its recipient to Roman citizenship. Another diploma was found dated November 124, and another dated in 132. Both were written for men serving in the unit of Syrian archers. Even more impressive is a tombstone preserved in the Great North Museum: Hancock at Newcastle upon Tyne that shows a Syrian archer, bow at his side.

These Syrians served alongside as many as 8,000 Roman soldiers from different parts of the empire, all separated into special units (*numeri*). Feeding them all was a logistical challenge, and archers capable of expert hunting would have helped.

Field archeologist Mike Bishop, however, contends that everyone hunted, and the primary value of the Syrian archers was tactical—on the battlefield. Their bows, he explains, were composite bows (also called "recurved"), capable of longer range than common longbows. "Correct and effective use of the composite bow," Bishop adds,





“took a lifetime to master, so Eastern recruits were essential.”

After Hadrian died in 138 CE, Rome briefly tried to expand its control north. Hadrian’s successor, Emperor Antoninus Pius, commanded the construction of a new wall, “the Antonine Wall,” some 150 kilometers north of Hadrian’s Wall. Largely of earth on a stone foundation about four meters wide and only three meters high, it required as much support as Hadrian’s—up to 8,000 Roman soldiers.

Archeological evidence from a fort at Bar Hill, an important fort along the Antonine Wall, shows that from approximately 142 to 158 CE, Syrian archers performed duty along this wall, too. In 1895 outside the Bar Hill fort, an altar was discovered, built to Silvanus, a Roman god of woods and fields, dedicated by Caristianus Iustianus, a prefect of the First Cohort of Hamians. A tombstone found near Bar Hill in 1603, now lost, bore the inscription, “To the spirits of the departed (and) of Gaius Julius Marcellinus, prefect of the First Cohort of Hamians.” These artifacts reveal that Syrians served not only in Britannia but also in Caledonia, now Scotland. In 158, when the order came from the emperor to withdraw from Caledonia, the Roman army abandoned the northern wall and repositioned back along Hadrian’s Wall.

Syrians serving Rome in Britannia were not allowed to bring their wives and families, and indeed, it was not until the reign of Emperor Septimius Severus (193–211) that even Roman soldiers were permitted to marry. Even after that, only officers were allowed to have their wives live with them inside the forts. Perhaps not surprisingly, archeological evidence shows that a local



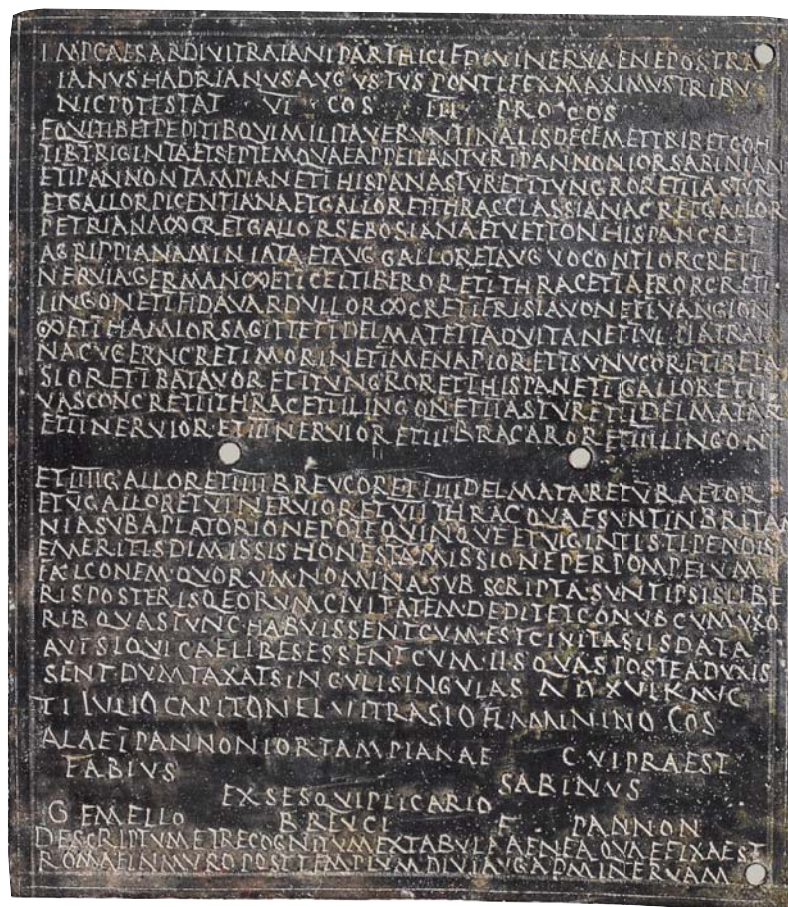
Other excavated tombstones from settlements along Hadrian’s Wall evoke the Syrian archers, who were valued for their proficiency with the composite (or recurved) bow, which appears in this funerary relief at lower right. Composite bows shoot farther than conventional longbows, and they are more compact. Lower: Syrians, like others who completed the Roman army’s standard 25-year term of service, received diplomas such as this one, found in Britannia, dated July 17, 122 CE.

settlement sprang up in the environs of virtually every fort. Such proximity gave locals opportunities to sell goods and services to the Roman garrisons—and to mingle. There is no reason to believe that Syrian archers would not have met locals—including women.

Such may have been the case for Barates and Regina. The tombstone inscription identifies Regina as a “Catuvellaunian,” of a tribe known to have inhabited central Britannia around the time. With no evidence to explain their meeting,

questions of Regina’s background remain: Could she have been the daughter of a stonemason working in the north? A trader, who in some way brought her to the attention of Barates? As on her tombstone, (“Alas!”), we simply do not know.

As for Barates, his identity hinges on the Latin term *vexillarius*, used to individualize Barates on his own tombstone, discovered in 1911 at Corstopitum (today’s Corbridge), some 48 kilometers west of Regina’s tombstone in South Shields. “Vexillarius” translates as either “flagbearer” or “vendor of flags and banners.” Barates, it appears, was neither a member nor a



veteran of the Roman army. It is thus plausible that he was instead a Syrian merchant or trader—not an archer. This, however, is not an entirely satisfactory answer: Was

## Hadrian visited Syria three times, first in 117, and again in 123, shortly after his visit to Britannia. In 129, he visited Palmyra.

there really enough commerce selling flags and banners to sustain a man and his wife (and children?) in a manner sufficient to warrant Regina's elaborate tombstone? Indeed, there is not even proof that the Barates of Corstipitum was also Barates, husband of Regina of Lugudunum. Barates was a common Syrian name at the time, and it is the proximity and dating of the gravestones that makes the supposition plausible.

Perhaps Barates dealt in more than flags and banners. Mary Beard, professor of classics at the University of Cambridge, notes, "There were Roman traders swarming over the eastern Mediterranean, cashing in on the commercial opportunities that followed conquest, from the slave trade and the spice trade to more mundane army supply contracts." Similarly, a Syrian merchant might well have traveled in the opposite direction, especially if archers, possibly even ones known to him, were bound for Britannia.

While only new archeological discoveries may offer answers regarding Barates's identity and motive, the capabilities of the archers were well known. Roman rule over Syria dated from at least 64 BCE, when Pompey annexed the province. In 70 CE the town of Emesa (modern-day Homs, some 160 kilometers north of Damascus) sent archers to aid the Roman siege of Jerusalem. Hadrian knew Syria, having first visited in 117 and again in 123, shortly

*Top:* Hadrian visited Britannia once, in 122 CE. *Right:* In 208, Emperor Septimius Severus traveled to Britannia with his wife, Julia Domna, of Emesa, now Homs, Syria. He remained there until his death in 211 in York, England.

after his visit to Britannia. He visited Palmyra a few years later in 129. Half a century after Hadrian's rule, Septimius Severus, who would later become the empire's first emperor from North Africa (Roman Libya), married Julia Domna, a

Syrian from Emesa, in 187. The two traveled to Britannia on a military campaign in 208, and they were still there when Severus died three years later, in York.

The story of a Middle Eastern presence in Roman Britannia did not end there. About 125 years later, at the close of the third century, Rome brought a contingent of boatmen from the Tigris River to the River Tyne-North Sea area to replace sailors Rome needed elsewhere in the empire. We learn this from the *Notitia Dignitatum*, a listing of the empire's important officeholders. Among the offices in Roman Britannia was *Praefectus numeri barcariorum Tigrisiensium Arbeia* (Commander of the Company of Barge-men from the Tigris at Arbeia).

Although estimates of the numbers of these bargemen range from 300 to 640, they were numerous enough that they influenced the name change of the fort in Lugudunum at the mouth of the River Tyne to become "Arbeia."

David Kennedy, a professor in the Classics and Ancient History Department at the University of Western Australia, theorizes that "Arbeia" derives from the Aramaic *arbaya* or *bet arbeia*, meaning "Arab house."

Excavations at South Shields reveal that around the end of the third century, the Romans launched construction at the fort to enlarge grain storage and build 10 new barracks. This suggests that, by this time, Arbeia played an important role in supplying grain to the garrisons stationed along the wall.





Reconstructed as a museum in South Shields, the gate to what was once the Roman fort of Lugudunum stands at the mouth of the River Tyne. By the late third century CE, the area around the fort was known as “Arbeia”—likely meaning “Arab house,” after boatmen from what is now Iraq were stationed there. Lower: This fragmentary tombstone commemorates a man named Barates, who archeologists speculate may have been the Palmyrene husband who erected a memorial to his Britannian “freedwoman and wife,” Regina.

However, no Roman road has been found linking Arbeia to the nearby fort at Corstopitum, 48 kilometers upriver. The shallowness of the River Tyne would have required the use of small boats or lighters—a task for which boatmen from the Tigris would have been well suited. From Corstopitum, grain could be delivered farther west by road. Paul Bidwell, head of archeology at Tyne and Wear Museums in Newcastle upon Tyne, and Nicholas Hodgson, who manages the museum’s archeological projects, believe that the Tigris boatmen also performed patrol duties along the North Sea coast, “anticipating, intercepting, and pursuing seaborne raiders from [the] north who attempted to bypass the Wall,” says Hodgson. This would have been a much more challenging task, but Hodgson reasons that from the time of Diocletian, in the third century CE, confrontations with the Persians on Rome’s eastern frontier could have produced boatmen “long trained and effective in aquatic operations.” To facilitate the training needed to operate in the open sea, the bargemen may have blended into local units upon arrival in Britannia.

How long did the men from the Tigris stay in Britannia? What did they do when their services ended? Did some remain and blend into the local population? The dearth of firm evidence is both frustrating and tantalizing.

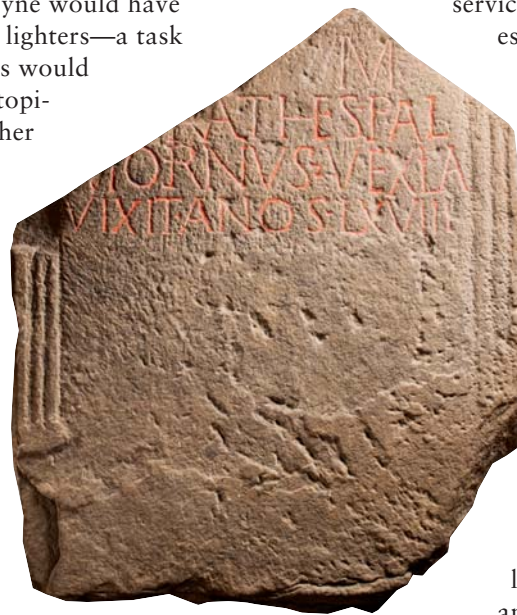
“These are mostly great unknowns,” says Hodgson. Two factors suggest many may have remained. First, after 25 years of service, Roman law granted citizenship to

military volunteers, who were then also exempt from taxation. If they completed a 25-year term of service, it seems likely that many would have established family relationships in Britannia during this time. Second, at the end of his service, a man who had been recruited in another province had to find his own way home—there was no help with travel expenses. David Breeze and Brian Dobson, archeologists specializing in Hadrian’s Wall, think that for these reasons most military veterans preferred to stay near where they had served. This would have applied no less to the archers: How many had left wives and children behind, and after 25 years in Britannia, how many would have returned?

In 411, the Romans withdrew their legions from Britannia, though contact and trade continued for several centuries.

From that era, we are left with a single, faceless, poignantly inscribed memorial to link us to bonds of devotion, forged through the vast instrument of an empire, between two people from widely divergent cultures, enriching them both.

Regina, Barates, alas. 🌐



**Charles O. Cecil** (chuck@cecilimages.com) served 36 years in the US Foreign Service, and he retired in 2007 to devote himself to photography and writing. His images are online at [www.cecilimages.com](http://www.cecilimages.com).



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Composite bow: S/O 03

Yemeni sailors in South Shields: N/D 09

# CHASING ZERO

WRITTEN BY  
ALAN MAMMOSER

PHOTOGRAPHED BY  
KEVIN BUBRISKI




Century after century, home along the east-central coast of the Arabian Peninsula generally meant a house of mud or coral brick, roofed with palm thatch, in a small town or settlement. Food staples were local dates and rice, as well as fish that came to shore aboard dhows powered by the winds. Cooking was fueled by wood, carried to the coast by camel from interior oases. It was an economy powered, directly and indirectly, by the sun. Though by today's standards it seems little more than sustenance, it endured. It was sustainable.

This all changed in the last century, of course, and in 2007 global population tipped its balance, for the first time, from rural to urban. More than ever, ours is a century of cities.

What kinds of cities will these be, five, 20, 100 years from now? From those carrying millennia of history to those built

entirely anew, we face pressing questions about not just where we live and how we get around, but also how much energy we use. "Carbon footprint" has become fundamental for thinking about cities. This has set before urban planners a challenge: How can we extend the lifestyle benefits of cities while minimizing their carbon costs? While many cities are experimenting with adaptations, the greatest prize is a city that is fully "carbon neutral" or "zero carbon." Is such a city possible? If we tried to build one, what might we learn?

Ten years ago, a few kilometers east of Abu Dhabi, the capital of the United Arab Emirates, the first attempt broke ground. A hybrid of some of the region's oldest, most sustainable urban ideas and new, high-tech ones, it was named "Source" in Arabic: *Masdar*.



Behind posters showing recently completed solar-powered buildings, new apartments in Masdar City rise to accommodate a population expected to grow from 2,000 today to 5,000 by 2019 and 50,000 by 2030. The residences will use 60 percent less energy and 40 percent less water than conventional ones.

## FORM FOLLOWS NATURE

“Our aim for Masdar City is to realize a template, a ‘greenprint,’ for sustainable urban development,” explains Yousef Baselaib, Masdar’s executive director of Sustainable Real Estate. It began as a blank slate, just six square kilometers of open desert, with seed capital from the government of Abu Dhabi. It faltered after the 2008 financial crisis, and several early design elements proved too costly, but its planners persist and adapt. The result is arguably the world’s largest urban sustainability project, and the lessons from it stand to inform city-making in the region and worldwide.

British “starchitect” Lord Norman Foster, long renowned for iconic buildings that are both visually memorable and environmentally sensitive, such as London’s jewel-like Swiss Re building and Berlin’s glassy restoration of the Reichstag, received the first commission from the Abu Dhabi government’s newly established Masdar Company.

“It was a highly experimental project,” says Gerard Evenden, who served as senior partner overseeing the master plan. “There had been environmental design of buildings for



YOUSSEF BASELAIB

Executive Director of Sustainable Real Estate

“Our aim for Masdar City is to realize a template, a ‘greenprint,’ for sustainable urban development.”

50 years, but when you start taking it to city scale, everything comes into play: infrastructure, utilities and mobility, how people get around.”

What happens within the buildings became just one piece of a puzzle. The streets between the buildings, and how these interact with the buildings, were all now of concern. The planners had to find the balance to achieve

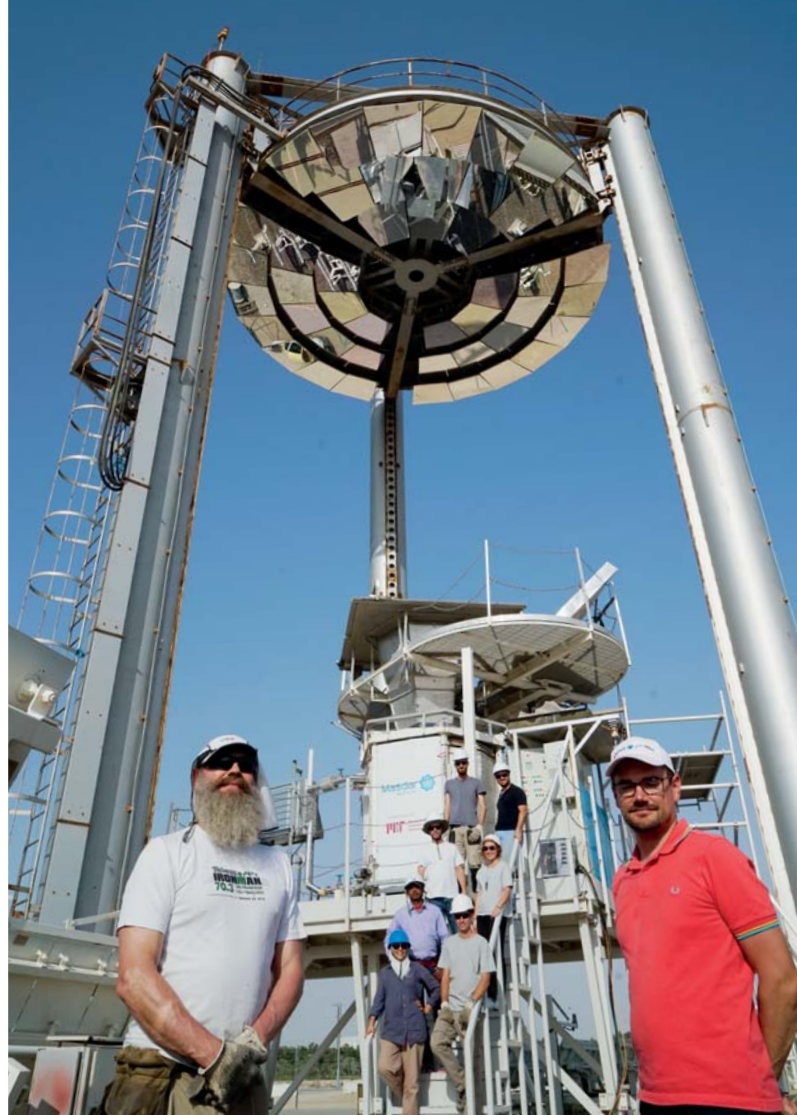


*Left: Flap-like squares vent heat from an atrium in the three-year-old Siemens building. According to the company, in its first year it used 63 percent less energy than a typical office building in Abu Dhabi. Lower: In Masdar’s experimental Seawater Energy and Agriculture System, young mangroves help clean wastewater that begins as effluent from fish and shrimp aquaculture ponds that passes first through a field of salt-water-tolerant Salicornia. At the end of the mangrove wetland, the water is returned to the sea; the Salicornia oilseeds are harvested to produce aviation biofuel.*



environmental sustainability for everything. The first challenge was the oldest: How to stretch, through the seasons, the number of comfortable—or at least tolerable—days without recourse to air conditioning? They began by looking at other old cities. From Fez to Cairo, Jiddah, Muscat, Shibam and even Venice, they saw how labyrinthine streets give a daily mix of light and shade. They looked at the relationships among living areas, markets, mosques and plazas to see how people have used urban space.

In Cairo, especially, they noted how narrow streets were often made short, blocked by buildings, so that warm air pouring into them is pushed up, flushing out heat. They saw this effect at work also in Yemen, in the mud-tower city of Shibam, where air becomes more turbulent amid the complex arrangement of buildings



Left: A 45-meter high harvester of the wind, Masdar City's tallest structure is a modern version of the region's traditional *barjeel*, or wind tower. Using a Teflon™-coated tube, it channels breezes to ground level. Right: Professor Alexander Slocum and Solar Platform Chair Nicolas Calvet flank their research colleagues at Masdar's prototype solar Beam Down Tower. It uses focused sunlight from 33 mirrors to melt a thermal energy storage reservoir of four tons of salt, which can be used to drive steam turbines both during the day and at night.

and streets, making the city a refuge from desert heat. To harness the cooling effects of breeze and shade, the team of Foster + Partners planners combined on-site wind and temperature studies with computer modeling of wind and sun. They found they could best harness the effects

of breeze and shade by orienting the entire squarish city along a northeast-to-southwest axis. Using the principle that at night land loses heat faster than water, this would, they reasoned, gather cooler winds coming off the desert more than the warmer breezes off the water. Then, in their



“We are producing food, in the form of fish and shrimp in an aquaculture farm, and we are also producing biomass that can be used to

produce other forms of energy.”

ALEJANDRO RÍOS GALVAN  
Director of Sustainable Bioenergy Research Consortium



“Storing the thermal energy from the sun during the day to reuse it at night when we don't have sun saves a lot of fossil fuel energy.”

NICOLAS CALVET  
Assistant Professor, and Chair of the Masdar Institute Solar Platform



boldest move, they raised the city onto a seven-meter platform, which split it into two levels. On top would be a shady, breezy, quiet, pedestrian-only zone, and all transportation would take place on the lower level. There, it would rely on a system of autonomous “Personal Rapid Transit” (PRT) vehicles—

driverless, six-passenger pod cars running on magnetic traction. These would zip around beneath the city and be easily accessible to everyone. As about 25 percent of any city’s carbon emissions come from transport, this network alone took Masdar City a long way toward a carbon-neutral goal.

“In the context of 10 years ago, we were way ahead in thinking about the future of mobility,” says Evenden.

Oriented to catch cooler winds from the desert and warmer ones from the water, Masdar’s square plan—shown *left* as a projection of the planned city—includes home and commercial sectors, with shaded pedestrian corridors and metro and light-rail lines. *Lower:* Taking inspiration from traditionally dense Arab world cities, buildings in Masdar are close together to provide shade and channel breezes.





# SUSTAINABLE CITIES

MASDAR CITY IS ONE OF MANY ATTEMPTS AROUND THE WORLD TO CONTRIBUTE TO KNOWLEDGE OF SUSTAINABLE CITY-MAKING.

A few have made notable strides toward reducing carbon emissions, conserving water and reducing waste. Stockholm's ability, built up over decades, to capture its waste and turn it into energy is exemplary. Dutch cities have long used careful planning to allow the most densely populated country in Europe to maximize preservation of farmlands. Copenhagen's EnergyLab Nordhavn focuses on managing complex, decentralized energy flows, and its emphasis on heating rather than cooling makes it a kind of northern counterpart to Masdar.

All of the more advanced cities share one or more increasingly common practices:

- Diverse, decentralized sources of energy production
- District-based systems for heating and cooling (as opposed to building-by-building systems)
- Advances in energy storage to allocate energy where needed in an open "energy market"
- Water conservation
- Regulation and tax incentives that favor energy efficiency in buildings, materials and design strategies
- Varied, integrated transportation systems that encourage mass transit, bicycles and walking



Visitors to Masdar Institute view a model of the city as currently planned for 50,000 residents and 40,000 commuting workers.

"We thought the vehicles couldn't be efficiently coordinated with people walking in the streets, so we separated them." Now, he acknowledges, emerging autonomous vehicle technology may make this concern moot, allowing autonomous vehicles to move safely in the unpredictable bustle of ordinary city streets. Only one PRT route was built, and although it's working, it's largely a tourist novelty now.



"The vision for Masdar remains as it always was. The way of delivering it has been changing."

**KATHY CUSACK**  
Head of City Design, Sustainable Planning and Approvals

## HIGH-TECH PASSIVE

Foster + Partners also built a home for Masdar Institute, which opened in 2010 in Masdar City. Now, nearly 1,000 post-graduate researchers and instructors are looking into dozens of aspects of sustainable-energy research, some focused specifically on Masdar and others on broader issues. The institute rises from the concrete platform near the center of the development site, and around it residences and labs



"We train human capital and create technological solutions in the area of sustainability through research at the graduate level."

**STEVEN GRIFFITHS**  
Vice President for Research; Associate Provost



## RATING ENERGY EFFICIENCY

In use since 1984, Leadership in Energy and Environmental Design (LEED) is a three-tier certification system—Silver, Gold and Platinum—developed by the US Green Building Council.

LEED certification may apply to commercial buildings, homes and neighborhoods. The system awards points in many areas of energy performance and construction techniques. The tier awarded indicates the extent to which a building or neighborhood meets efficiency and offset standards.

Established in 2007 and managed by the Abu Dhabi Urban Planning Council, Estidama takes its name from the Arabic word for “sustainability.” While similar to LEED, it is specific to the cultural and climatic conditions of the Arabian Peninsula. Its rating system awards from one to five “pearls,” with five pearls being the highest. Masdar City is targeting a four-pearl Estidama Community Rating, which would be the highest ever given to date for a community.

Masdar City’s prototype two-story, four-bedroom Eco-Villa consumes just 25 percent of the energy of a comparable, typical Abu Dhabi home at equivalent construction costs. Equipped with 87 rooftop solar panels, it is intended to be a net contributor to Abu Dhabi’s electrical grid.

are arranged precisely, separated by narrow *sikkak* (passages) and courtyards that make the most of—and even amplify—breezes and shading. With its height above the ground making air movement slightly faster, the house produces temperature measurements that, compared to central Abu Dhabi, show what architects call “felt heat” can be cooler by as much as 10 degrees Centigrade.

“It’s telling the wind what to do,” says Senior Design Manager Chris Wan, who describes how Masdar extends the “crossover line” for comfort by as much as a month at each end of Abu Dhabi’s summer. A Hong Kong native who has been with Masdar



“3-D printing of lightweight structures can be used as a support for catalytic converters in the automotive industry.”

**DRAIB AL-KETAN**  
Graduate student in lightweight structure fabrication



# WHAT DOES ZERO CARBON MEAN?

THERE ARE TWO MAJOR WAYS A CITY MOVES TOWARD NET ZERO CARBON: REDUCTIONS AND OFFSETS.

Conservation and efficiency are hallmarks of carbon reduction, and clean-power generation that exceeds a city's own demands—such as Masdar's solar fields—are examples of offsets. Net results can be calculated city-wide by looking at electricity, heating and cooling, transportation, industries, construction and any other factors that affect energy use and production. A zero-carbon city is one that replaces the carbon-based resources that it uses.

since 2008, Wan describes how the designers blended high technology with passive design to coax nature's forces to act benevolently.

Energy demand from the buildings is 40 to 50 percent lower than typical for the area, he explains, "including a/c, lighting, everything." Wan also points out how the buildings' unique facades contribute to these gains: The red-hued student residences, for example, have wavy walls of glass-reinforced concrete that moves breezes. Windows have narrow slats on the outside that are modern reinterpretations of the traditional Arab *masbrabiyya* or lattice window screens, which prevent sunlight from touching the glass. Lab building walls use layering to defend against heat, with outer plastic sheets into which low-pressure air is injected atop insulating fabric and aluminum panels.

Anchoring the platform's northern corner is the first LEED Platinum-certified office building in Abu Dhabi, the

Middle East headquarters of the German energy and utility company Siemens. Toward the opposite corner of the platform is the headquarters of the International Renewable Energy Agency (IRENA), the country's first "four-pearl" structure under the Estidama certification system. (See sidebar, p. 16.)

Between Masdar Institute and the Siemens building, narrow sikkak draw breezes through a shaded courtyard. At its center, Masdar's tallest structure, a prototype *barjeel*, or wind tower, reaches 45 meters high, well above the surrounding buildings, to where its wind scoop can harvest breezes. This iconic piece, visible from afar, is perhaps Masdar's most eloquent synthesis of traditional and

The current population of Masdar City is made up of students and faculty at Masdar Institute and employees of companies including Siemens, General Electric, Mitsubishi and the International Renewable Energy Agency. Above: Engineering research assistant Abdulrahman Alzaabi's apartment is shaped by the wavy walls that help move breezes outside.



"Microorganisms and biological systems can help us by remediation (cleaning water), help the storage of CO<sub>2</sub> in the atmosphere through

photosynthetic organisms [and] mitigate issues for human health."

HECTOR HERNANDEZ

Assistant Professor of Chemical Engineering





“We have sunny weather but also a turbid atmosphere that we have to take into consideration in designing PV [photovoltaic]

technology adapted to the climate here.”

HOSNI GHEDIRA

Director of Renewable Energy Mapping and Assessment

high-tech passive design. Based on the mud brick barjeel of the region’s traditional houses, it captures and channels winds down into the courtyard, cooling the air along the way. Made of a huge Teflon tube in a metal frame, it links to a roof-mounted weather station that sends atmospheric data to a computer whose algorithms are taken from research on human comfort levels in this region. The computer controls the tower’s wind capture and even the injection of mist for evaporative cooling of the breeze.

Then there is solar power. Above the courtyards, edges of south-oriented rooftop photovoltaic solar arrays project sawtooth silhouettes. These provide about 30 percent of the buildings’ energy needs. The remainder comes from Abu Dhabi’s electrical grid, but what Masdar uses, it more than replaces. Its 10-megawatt solar plant along Masdar’s northwest edge and the Masdar Company’s new 100-megawatt Shams 1 solar power station, located in the desert 120 kilometers away, together send enough power to Abu Dhabi to power Masdar City six times over.

Visiting students get ready for a ride on the Personal Rapid Transit (PRT), which still operates on the lower deck of the first sector of the city. Although city-wide PRT plans were suspended to control costs, light-rail and metro lines are under construction.



## MIRAGE CITY?

To date, only the first of Masdar’s five planned phases stands built. Siemens, IRENA and a few other companies are showing Masdar’s potential to become an incubator of new energy businesses, which the government is also encouraging through its designation of Masdar as a tax-free zone for foreign businesses.

Evenden says that when Foster + Partners finished its work in 2012, Masdar City was carbon neutral. The firm also tried to be as carbon neutral as possible during construction, by sourcing materials and recycling construction waste, although it could not displace the energy requirements of conventional construction machinery.

“When we started at Masdar, we had high level goals, net-zero carbon, net-zero water, net-zero waste,” says Chris Drew, who worked on Phase 1 during 2008 and 2009 as Masdar’s sustainability manager. He continued on with Adrian Smith + Gordon Gill Architecture, whose design for the Masdar Company’s headquarters awaits groundbreaking. Technically, and from an energy efficiency point of view, “extending the podium platform out for the whole city would have worked,” he says. “But there came a point during first phase construction when the project had to face dollar values.” As it was, he says, “it became prohibitively expensive.”

All the more so as fallout from the financial crisis of 2008 put the brakes on construction not only at Masdar, but throughout the region. Since then, the master plan has been trimmed from an estimated original total cost of \$18–22 billion to approximately \$16 billion. Most visibly, the planners dropped the platform concept and accepted cars on the streets. This shifted their overall goal from “zero carbon” to “low carbon.” (See sidebar, p. 17.)

“When we began, the idea was to have everything under one control,” says Masdar City’s Director of Planning Anthony Mallows. “We were working with a single source of funds, as a single developer, with one complete master plan,” he continues. “We realized by 2010, we cannot achieve a ‘greenprint’ city just with our own funding, guided just by our own ideas. It’s not something we can do all by ourselves.”

Trained at MIT, Mallows came in as executive director in 2013 with a charge to get Masdar building again. “We moved from self-developer to a three-part system: self-develop, where we push the envelope; joint venture with our high standards; and third-party venture where we are master developer and they must follow our standards under the master plan.”

This, he maintains, has opened the door to other developers and exposed the project more to market forces. This aligns it better with the reality of city building. “We’ve come from ‘we’ll do everything and we’ll build a product’ to the idea that cities are how the world builds things. They are a process,” says Mallows.

This new openness has at least partly

revived Masdar City's fortunes. Phase 1 of nearly 1 million square meters is now complete or under construction. New apartments are rising around the institute. Detailed master planning is now finished for Phase 2, which will rely on bids from outside developers. The goal is to build about 1 million square meters every five years, based on market demand, through 2030.

"We're working on these projects now in a way that's a little more grounded,"

Messages to Masdar, right, cover a wall panel following public programs during January's Abu Dhabi Sustainability Week. Lower: Masdar's first park includes not only play equipment but also an audience-powered outdoor cinema: About a dozen of its viewing seats are also stationary bicycles.





“I am driven by the will to act to address current global issues. I look forward to contributing to the large-scale deployment of renewable energies.”

**RADIA LAHLOU**

Graduate student in concentrated solar power and thermal energy storage

says Drew. “Any technology has a limited life cycle, so we’re trying to integrate technologies without becoming dependent on them.”

**PHASE 2 AND BEYOND**

Now, the most pressing task for Baselaib’s team of planners is to fill the city’s empty quadrants with homes, workplaces and schools for the 50,000 residents who are expected to live here, as well as the 40,000 commuters.

“Norman Foster’s plan began with a powerful vision, and the vision for Masdar City remains as it always was,” says Kathy Cusack, who, as head of city design and approvals, helps coordinate the development phases in the several parts of Masdar. “The way of delivering has been changing,” she adds.

Now, she explains, the city is set out in quadrants, each with major and minor streets and neighborhoods. “It gives clarity for potential investors and residents who want to see where things are, where their kids’ school will be,” she says.

Key to a city both livable and sustainable is an interregional transit system, and Abu Dhabi’s planned metro will run through Masdar, linking it to central Abu Dhabi and the nearby airport sometime after 2020. She says a light-rail tram is also foreseen, as is a “‘circulator’ of some kind”



“What we want to produce now is something that other people can borrow from.”

**CHRIS WAN**

Senior Design Manager



With its wind tower playing an iconic role not unlike a central skyscraper in a more conventional city, Masdar City limits its building height to five stories to maximize energy efficiency. The original platform separating the transportation-oriented lower level can be seen below the buildings, center. The master plan calls for a green corridor, now under construction, along this strip of sand.

to serve the residential quadrants—all to try to minimize automobile reliance.

The planners believe that with Phase 2’s implementation, they will make further gains toward the low-carbon goal. Under construction is the prototype two-story Eco-Villa, a comfortable home equipped with solar panels that consumes just 25 percent of the energy of a typical Abu Dhabi house. The goal is to achieve net-zero energy consumption. Success, Cusack points out, could mean a new paradigm for housing in the region.

Cusack explains that the new master plans are, perhaps not unexpectedly, increasingly detailed in their blendings of passive design and high tech to achieve energy savings at high comfort levels.

“Now we have numbers,” says Cusack. “We know we need 35,000 trees and their shading targets. We know what



places have a water target of two liters per square meter per day, and so forth.”

With these tools in place, she can work with developers on the details of community design in the clusters and small squares connected by a combination of narrow sikkak, open spaces and roads.

## EXPERIMENT CITY

As Abu Dhabi itself fills in the desert around Masdar with its own relentless, more conventional growth, the question remains to what extent will Masdar realize its zero-carbon dream? And of even more interest to the world, to what extent will its greenprint fulfill its own Arabic name to become a source of knowledge for city builders everywhere?

“Minimizing Masdar City’s carbon footprint is an ongoing process,” says Baselaib. “With each new building, each new phase of development, we’re pushing the envelope further. We’re constantly learning.”

Indeed, as they see it, Masdar City is one very large

experiment. Says Wan, “What we want to produce now is something that other people can borrow from.”

Ultimately, Wan points out, it’s not about the actual city. It’s about the process of getting to it. A low-carbon city on the edge of anywhere else, he says, would—and should—look entirely different from Masdar. The technologies will evolve and develop, “but how to get such a city going? That’s where learning is needed. That’s where Masdar’s experience will resonate.” 🌐



**Alan Mammoser** writes about cities, the environment, energy, infrastructure and planning. He writes the weblog [www.warmearth.us](http://www.warmearth.us). **Kevin Bubriski** ([bubriski@sover.net](mailto:bubriski@sover.net)) spent the past year in Nepal on a Senior Scholar Fulbright Fellowship. He teaches documentary photography at Green Mountain College in Poultney, Vermont. His most recent book, *Look Into My Eyes: Nuevomexicanos por Vida 1981-83*, was published last year by the Museum of New Mexico Press. Instagram: [kevinbubriski](https://www.instagram.com/kevinbubriski).



[www.masdar.ae/en](http://www.masdar.ae/en)

# The WHITE OLIVES of Malta

WRITTEN AND PHOTOGRAPHED BY TOM VERDE



Greeting me at the gate of his farm in the hilltop village of Wardija, Sam Cremona ushered me to the porticoed dining and kitchen area where he holds olive oil tastings. Opening a cupboard, he showed me several dozen jars of his rare *bajda*, or white olives, blushed by brine to a pale ivory-pink. “I wish I could give you some, but the Maltese government has asked me to save all I have to give as a gift to the president of the EU,” he said with an apologetic shrug.



Since 1999 Sam Cremona has led the revival of the olive industry in Malta. As one of the island nation's few operators of an olive press, he processes both his own harvests and, *right*, others from nearby farms. *Opposite*: Though the varieties of the European olive, *Olea europaea*, number in the hundreds, the *bajda*, or var. *Leucocarpa*, is uniquely pearl-white.

**T**hat the government should turn to Cremona—informally known as Malta's godfather of olive oil—for the rare white olive is not surprising. Since 1999, when he began processing oil from trees planted on his farm eight years earlier (using an imported Sicilian olive press, as there were none left on Malta at the time), the 66-year-old Malta native and retired gemologist has dedicated himself to reviving what had been a moribund industry. Prior to his efforts, Maltese olive varieties like the *bajda* and the more common, more conventionally colored *bidni* had all but disappeared after thriving for several thousand years on this rocky, sun-drenched nation of islands that poke out of the central Mediterranean between Sicily and North Africa.

Nor is a European aristocratic appetite for Maltese white olives anything new. Back in the days of the Knights of the Order of Saint John—known also as the Knights of Malta, a multinational order of Crusaders that held the island from 1530 to 1798—these plump, bone-white olives were known across Europe as *perlina Maltese*—Maltese pearls. *Bajda* trees adorned the gardens of wealthy knights, and their fruit featured in recipes for one of the country's signature dishes—rabbit stew.

According to documents unearthed by Cremona, one of the knights, a French doctor, wrote about the grafting and propagation of white olives, and more generally, olives appear frequently in reports on Malta's agronomy. "This island is irrigated with springs, and it has plantations of ... olives and vines ... and fig trees, besides every other kind of fruit," wrote clergyman Johannes Quintinus in his 1536 *Insulae Melitae descriptio*. (*Melita* was the classical name for Malta, possibly from the Greek word *meli*, meaning "honey," for which the island was also known.)

The white olive is just one of hundreds of varieties of the European olive (*Olea europaea*) found from Portugal east across the Mediterranean all the way to the Arabian Peninsula.



la. One of its botanical subclassifications is *Leucocarpa*, from the Greek *leukos* (white) and *karpos* (flesh or pulp). White olives also grow in Italy, Morocco, Libya, Greece and Portugal, where they often go by local names, including *bianca* (in Italian "white"), *biancolilla* or *cannellina* (after their resemblance to white cannellini beans). Researchers who have studied the white olive's genetics say that its unique color, or lack thereof, is simply a quirk of nature.

"White olives originate from mutations affecting the production of anthocyanins, those pigments typical of what you see in conventional ripened olives, so that at the full ripening stage they do not become black," explained Antonella

Pasqualone, professor of food science and technology at the University of Bari in southern Italy. The white olives, she added, "are not very diffused and are normally rare."

This is why they are seldom commercially available today and, historically, why they have been valued ornamentally and even religiously, she continued. In the southern Italian region of Calabria, for example, white

olive trees in the gardens of churches and monasteries provided sacramental oil used to anoint high-ranking church officials and Byzantine emperors. In the Qur'an, although white olives are not mentioned specifically, several verses refer to olives and olive oil as gifts from God. (See sidebar, p. 25.)

Oil from white olives resembles that from black and green olives, yet it has a much shorter shelf life, owing to compara-

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*“White olives originate from mutations affecting the production of anthocyanins, those pigments typical of what you see in conventional ripened olives, so that at the full ripening stage they do not become black.”*

Senior Agricultural Officer Carmelo Briffa inspects a white olive tree cultivated in a government nursery of some 20 indigenous varieties. Of the island nation's 12,000 olive trees today, only 70 are white olive trees.

tively low levels of bitter-tasting antioxidants that also make for a natural preservative. "A table olive of fairly good quality, but does not keep well," observed the late, pioneering Maltese botanist John Borg in his 1922 study, *Cultivation and Diseases of Fruit Trees in the Maltese Islands*. Thus, white olive oil tastes sweeter than many common olive oils, with which it is sometimes commercially blended.

Perhaps tempted by the delicate flavor of their oil, or charmed by their ornamental appeal, it was likely Italian knights who, probably sometime during the Renaissance, introduced white olives to Malta, Cremona said. Research by Frederick Lia, an ethnobotanist and biotechnologist at the University of Malta, has focused on the health benefits of Maltese olive oil, and he supports Cremona's assertion. "My personal opinion is that the bajda is in fact an Italian cultivar brought from southern and central Italy as an ornamental plant," Lia explained. "Evidence of this is the lack of wild white olive trees in Malta and the restricted number of old, individual trees."

That number of old trees was down to precisely three when Cremona first set eyes on one in 2010. "It was in a nursery, in a garden that once belonged to the knights," said Cremona. At first, he thought the startlingly white olives might be diseased, or albino aberrations. However, after taking some to an olive conference in Spain, he learned that Malta possessed a rare treasure.

"They told me, 'Ah, we know about these white olives. We used to have them, but we don't have them anymore,' because they were a variety that had disappeared in Spain, where they were known as 'Maltese olives,'" Cremona stated. His trip to Spain was part of wider initiative he had helped launch in 2006 called the Project for Revival of the Indigenous Maltese Olive (PRIMO), in cooperation with Malta's Ministry for Rural Affairs and the Environment and with funding from the local Bank of Valetta.

Dismayed that Maltese olive oil was no longer being produced on the islands, Cremona hoped to revive interest. *Olea europaea* olives in Malta date back some 5,000 years or more, to the late Copper Age, according to carbonized remains of cultivated olive trees excavated at the temple complexes at Skorba. Such evidence indicates that olives were planted there around the same time they began spreading west from the Levant across the Mediterranean.

Phoenicians settled in Malta around 800 BCE, and they, too, cultivated olives. Under the Romans, from the third century BCE to the fourth century CE, olive production on the islands reached its height, as olives and olive oil were prized commodities in the imperial economy.

"This whole valley was covered with olive trees," said Cremona, as he toured me around the grounds of his one-hectare plantation, once part of a larger Roman



villa. Just down the terraced hillside, at the ruins of San Pawl Milqi, another villa, massive stone olive presses and oil storage cisterns hint at the magnitude of Malta's former olive oil industry.

Equally if not more impressive is the nearby site of Iż-Żebbuġ tal-Bidnija. This grove of 20 bidni olive trees, like a den of dozing grandfathers, is believed to be the oldest olive grove in the country, dating to Roman times and perhaps earlier. The gnarled and twisted trees, averaging some five to eight meters in height, still bear fruit, though the olives are too small



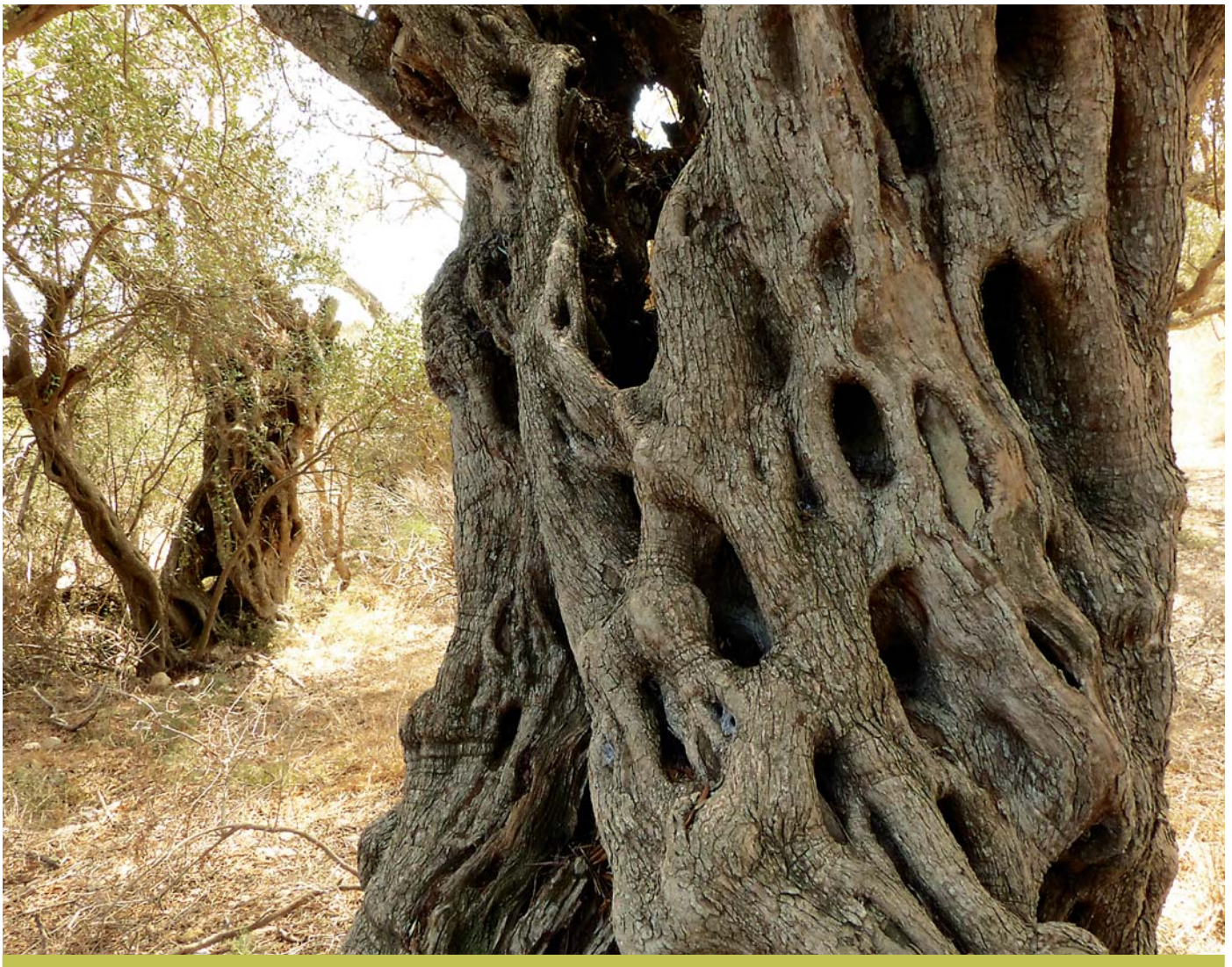
for harvesting. The Maltese government designated them as national monuments, and the United Nations Educational, Scientific and Cultural Organization (UNESCO) named them groves of “Antiquarian Importance.”

Under the Byzantines, Malta continued to thrive as a trading center and source of olive oil. Towns and villages with names referencing olives and olive oil production include Ghasri, which takes its name from *ghasar*, “to squeeze” (as in olive pressing). Żebbuġ is Maltese for “wild olives,” and Birżebbuġa translates as “olive well.” The city of Iż-Żejtun, site of an annual olive festival, derives its name directly from *zaytun*, the Arabic word for olive.

Though olives and olive oil figure prominently in the traditional Arab Mediterranean diet, Malta’s Arab colonizers were more partial to growing almonds, blood oranges (which they brought from Sicily) and cotton, for which Malta was known in antiquity and which continued to be an important crop up to early modern times. Popular legends say the Arabs actually cut down olive trees to use the wood for ships and clear the land for cotton, but

Believed to be the oldest in Malta, these bidni olive trees stand among some 20 that have been here since at least Roman times. The Maltese government has designated them as national monuments.

In Islam the Qur’an references both the olive tree and olive oil, as do several hadiths (sayings of the Prophet Muhammad). “He causes to grow for you the crops, the olives, the date-palms, the grapes, and every kind of fruit,” reads Sura 16:11. In Sura 24:35, the plant is praised as the “blessed olive tree.” “Eat olive oil with your bread,” Ibn Majah recorded the Prophet advising his followers, while Tirmidhi wrote, “The Prophet (peace and blessings of God be upon him) said: ‘Eat olive oil and use it on your hair and skin, for it is from a blessed tree.’”



modern historians mostly regard such accounts as exaggerated. Another legend, also likely apocryphal, holds that the Arabs attached special value to Malta's indigenous bidni olives because their slightly curved shape bore resemblance to a crescent moon.

Following the Arabs came the Crusader knights; after them came the French; and then the British, who ruled the island from 1813 until independence in 1964. The English preference for butter and lard over olive oil relegated olives to the diet of the common people, who were content with "a clove of garlic, or an onion, anchovies dipped in oil, and salted fish," as French knight Louis de Boisgelin observed in his 1804 history, *Ancient and Modern Malta*.

**S**ettling back for an evening of traditional food and folkloric

songs and dances, I headed to Malta's northern town of Mosta and Ta' Marija Restaurant, which offers a top-notch version of the classic sampler, Mizet Malta, or Maltese Mezze. In between performances by young women wearing the distinctively Maltese black, hooped headscarves called *ghonnella*, owner Marija Muscat informed me that, despite its vicissitudes over the centuries, olives and olive oil remain

essential in Maltese cuisine and culture.

"They are used widely on our island, in food and for medicinal purposes. You will find a jar with olives and olive oil in every household in Malta," she said.

Yet for much of modern history, most olive oil on Malta has been imported, from Italy and elsewhere, even though the archipelago's subtropical, Mediterranean climate and rich, alkaline soil make it ideal for olive cultivation. Now, by encouraging landowners to grow native olive species, Cremona and the PRIMO initiative, which ran through 2012, have helped bring back Malta's unique olives—including both the

bajda and the bidni.

"Thanks to this project, the population of olive trees in Malta is now growing," Senior Agricultural Officer Carmelo Briffa acknowledged as he walked me through the government's leafy nursery of fruit trees in Gham-

“ ”

*Despite its vicissitudes over the centuries, olives and olive oil remain essential in Maltese cuisine.*

mieri, in central Malta. It's home to 20 varieties of indigenous olives, including white olives. Now, at least 12,000 olive trees, including 70 white olive trees, are productive on dozens of farms throughout the Maltese Islands. The number of commercial presses has gone from the single one Cremona imported in 1996 to at least nine. Smaller, artisanal farms, such as Djar il-Bniet (House of the Sisters) in Dinghli, near Malta's western shore, where I wandered through groves of 800-year-old olive trees, bottle single-varietal batches of olive oil that are sought after in the culinary world. During a 2013 visit to Cremona's farm, British celebrity chef and cookbook author Jamie Oliver gave Maltese olive oil high marks for "freshness" while marveling that "the white olive tree [had] fruit of such pearlescent beauty that it would have seemed a crime to pick them." At last year's Olio Officina Festival in Milan, Maltese white olives were commended for taste, quality and appearance.

Science, too, has weighed in. Borg long ago observed that the bidni tree and its fruit "are very resistant to disease" as well as the dreaded olive fruit fly, *Dacus oleae*. Modern analysis has confirmed that this is because the bidni is high in oleuropein, a natural antibiotic that also makes the oil an exceptionally healthy choice for human consumption. Most recently, University of Malta researcher Oriana Mazzitelli in a 2014 study compared the DNA of three Maltese cultivars—bidni, bajda and another common variety called a *Malti*—with an Italian and a Tunisian variety.

The results, she said, surprised her. "The genetic differences were greater than I expected, which suggests that Maltese olives diverged at some early point and became extremely different than the rest of Mediterranean olives," she said.

Cremona pours freshly pressed olive oil. A recent genetic study suggests that due to Malta's isolation, at least three Maltese cultivars, including the white olive, may have developed characteristics more distinctly local than researchers previously believed.





Olives, and olive oil, are best preserved when shielded from light. Soon after this photograph was made, Cremona returned this jar packed with white olives to a dark storage cabinet.

Mazzitelli's findings also reinforce Lia's claim, first proposed by Borg nearly a century earlier, that the white olive may be a variant that had been introduced at some point later than the other varieties.

**B**ack at Cremona's farm, I joined him to take pity on a writer who had traveled 7,200 kilometers to investigate his singular, ivory-colored olives. In the kitchen, he fetched a jar from the darkness of another wooden cupboard. As if this crypt wasn't deep enough to shield his olive pearls from the flavor-sapping light of day, he peeled back layers of aluminum foil that encased the jar before opening its lid and plucking from the jar's mouth a pair of oil-soaked bay leaves. He dotted a plate with a half-dozen or so pale, dimpled olives, swimming in golden oil. Then he showed me how to enjoy them like a native.

"Here, you go like this," he demonstrated, proffering a hunk of crusty bread. "Dip the bread in the oil first, and suck on it. Don't chew the bread."

I followed his instructions. The flavor was rich and peppery, yet at the same time mild and sweet. After observing protocol, I gobbled down the bread and headed for the prize:

my first white olive. The flavor was ... delicious—bitter top, citrusy middle, briny finish. Reaching for another, I thought to myself, "If I could actually eat a pearl, this is just about how I'd expect it to taste." 🌍



**Tom Verde** ([tomverde.pressfolios.com](http://tomverde.pressfolios.com)) is a regular contributor to *AramcoWorld*. His "Malika" series, on historical Muslim queens, won "Best Series" awards from both the National Federation of Press Women and the Connecticut Press Club in 2017.



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# WHY REINVENT THE WHEEL?

WRITTEN BY **GRAHAM CHANDLER**

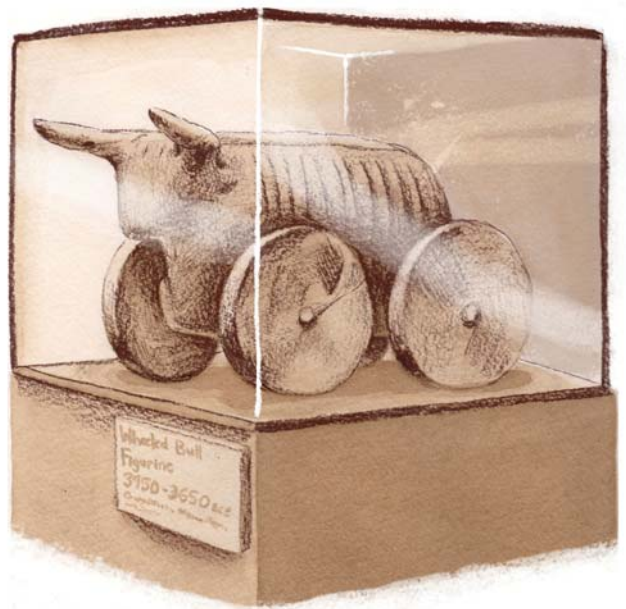
ILLUSTRATED BY **IVY JOHNSON**

**ASKED TO NAME THE GREATEST INVENTION EVER, NINE TIMES OUT OF 10 MOST PEOPLE MIGHT SAY, “THE WHEEL, OF COURSE.” AND HOW WAS IT INVENTED? “WHY, IT STARTED THOUSANDS OF YEARS AGO, WITH LOG ROLLERS, AND WHEN SOMEONE CUT OFF THE END OF ONE, YOU GOT A WHEEL.”**

**T**hen the technology spread, and it changed the world, right? Its taken-for-granted simplicity has become the modern cliché, “Why reinvent the wheel?”

But actually, where and when was the wheel invented first? And what impact did it really have? Perhaps it began in Eastern Europe, in the Carpathian Mountains, around 3600 BCE, when mineworkers, exhausted by lugging baskets of copper ore out of tunnels and trenches, put them on a plank fitted with four wooden disks and began rolling them—very roughly no doubt—to the mine’s entrance.

That’s the hypothesis of Richard W. Bulliet, who had taught both Middle Eastern history and the history of technology at Columbia University from 1976 to 2015 and last year authored *The Wheel: Inventions and Reinventions*. His book takes on several generally accepted theories,



This wheeled ceramic bull was found in western Ukraine and dated to the early to mid-fourth millennium BCE, which makes it the oldest known object to have used a wheel. It is on display in the Museum of Cultural Heritage in Kiev.

starting with the long-held belief that the wheel came out of Mesopotamia. Despite the wheel’s almost elemental simplicity, it turns out that its pedigree follows, we might say, a very long and winding road—and not even just one road. The closer one looks, the more its origins and history are fraught with conjecture—enough to generate countless papers and numerous books.

Over email exchanges early this year, I moderated a



Men tired of lugging copper ore from mines in the Carpathian Mountains in Eastern Europe may have been the first to engineer a wheeled cart around 3600 BCE, argues history professor Richard W. Bulliet. That's some 700 years before the wheel appeared in Mesopotamia.

Mountains of western Ukraine that dates between 3950 and 3650 BCE. Fragmentary remains of cart-size wheels found in southern Germany and at the Slovenian capital of Ljubljana, all from the same general time period, corroborate this.

Daniel Potts, professor of ancient Near Eastern archeology and history at New York University's Institute for the Study of the Ancient World, agrees with Bulliet's premise that "the European evidence of wheeled vehicles predates that known from the Near East." But he argues against Bulliet's suggestion that the earliest four-wheeled vehicles functioned as mining carts. Gravesite finds from that region and time period show the rarity and small size of metal objects,

discussion of the wheel among Bulliet and three leading experts in the history and the archeology of technology. We took up four of Bulliet's most contentious ideas.

## WHERE, AND WHEN, WAS THE FIRST WHEEL USED?

Eastern Europe, says Bulliet, citing carbon-14 (C-14) dating of wheels and models of wheeled vehicles recovered in the Carpathian Mountain region of Hungary and neighboring countries. The C-14 data, he says, indicate that wheels appeared there around 3600 BCE. This precedes the date of approximately 2900 BCE proposed for Mesopotamia by British archeologist Stuart Piggott, who bases his conclusion on pictograms on clay tablets from the Sumerian city of Uruk. Piggott's thesis, posited in *The Earliest Wheeled Transport: From the Atlantic Coast to the Caspian Sea* (1983), has been generally accepted—until now.

Bulliet says the earliest known example of an object with wheels is a figurine of a bull found in the Carpathian

which suggest that less metal was then being used in the region compared to the earlier Middle and Late Copper Age. "Indeed, to find such small numbers of metal artifacts in this region, one must go back to the Late Neolithic, over 1,000 years earlier," Potts says.

Bulliet interprets the situation differently. He contends that declining copper use may have underscored rather than undercut the need for advances in mining efficiency. "Inventions to improve the yield or efficiency of something frequently coincide with a gradual failure of traditional methods," he says,



**RICHARD W. BULLIET**



Flat depictions of what scholars believe are four-wheeled wagons are incised on a ceramic pot from southern Poland dated to the middle of the fourth millennium BCE. Although they appear to offer proof of early wheel use in Eastern Europe, scholars are still debating where the wheel originated: For example, the so-called Ljubljana wheel, *lower*, discovered in a marsh in central Slovenia, dates close to the Polish pot—around 3200 BCE. Made of ash wood, its radius is approximately 70 centimeters, and it was fixed to a rotating axle on a two-wheeled cart.

citing Newcomen’s engine for pumping water from mines in 18th-century England and the development of water injection in the early 20th century to boost production in older US oil fields. “Scarcity in comparison with an earlier period does not necessarily mean reduced interest or perception of value,” he adds.

David W. Anthony, professor of anthropology at Hartwick College in Oneonta, New York, and author of the acclaimed book *The Horse, the Wheel, and Language: How Bronze-Age Riders from the Eurasian Steppes Shaped the Modern World* (2007), agrees that the oldest C-14 dates for wooden wheels are currently from the Carpathian region. But that, he says, could change at any time. “Prior to the discovery of the Ljubljana wheel, the oldest dates were from wooden wheels in the steppes—Bal’ki on the Dnieper and the Ostanni *kurgan* [earthen burial mound] in the Kuban River steppes—and from southern Germany,” he says. “Another find in a bog could change the location of the oldest date on actual wheels.”

Anthony adds two other bits of evidence that widen the range for the possibilities of wheel development. Under a mound at Flintbek, Germany, well-defined wheel tracks have been carbon dated using the organic components of the sediments into which they were pressed, and they

turn out to be as old as the Ljubljana wheel. There is also the simple, almost schematic depiction of a four-wheeled wagon that appears on a ceramic vessel found at Bronocice in southern Poland, and which is probably even a little older. Anthony does not, however, regard this as conclusive. “While the evidence for wheels is later by three or four centuries in Mesopotamia, I think it is premature to say that wheels certainly were not invented there,” he cautions. “There are arguments for multiple origins—for steppe origins, for Mesopotamian origins and for Tripolye-culture [in Ukraine, Moldova and Romania, circa 4600–3000 BCE]

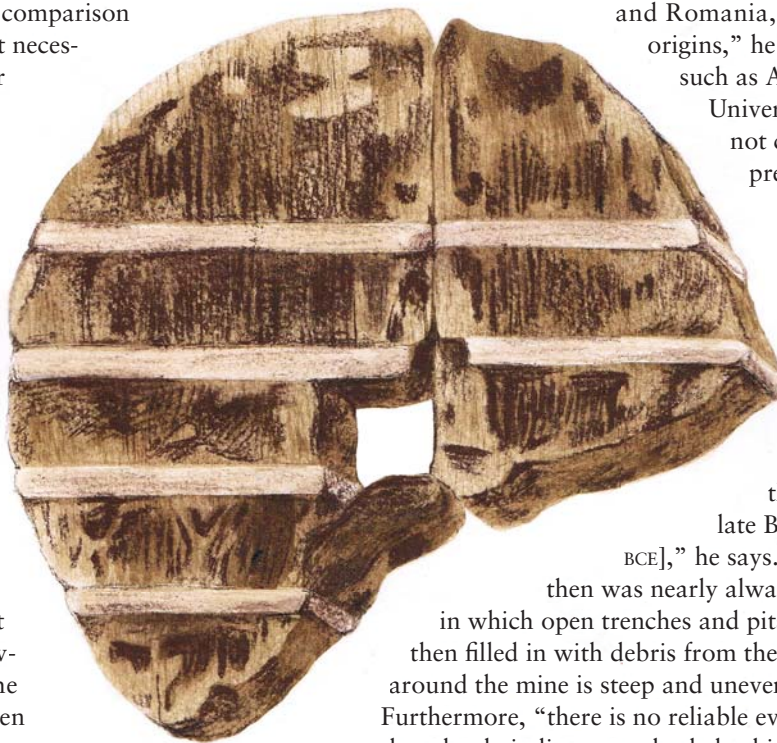
origins,” he says, citing researchers such as Asko Parpola of the University of Helsinki. “I’m not certain we can choose on present evidence.”

Nor does Anthony agree that fourth-millennium-BCE tunnel mining in southeastern Europe led to the invention of the wheel. “There were no tunnel mines where an ore cart might make sense

that I know of until the late Bronze Age [1300–1100 BCE],” he says. He believes that mining then was nearly always more like strip mining,

in which open trenches and pits were excavated and then filled in with debris from the next one, “so the terrain around the mine is steep and uneven, not good for wheels.” Furthermore, “there is no reliable evidence in any medium that clearly indicates a wheeled vehicle in southeastern Europe dated before about 3600 BCE, and these mines had ceased to function centuries before that.”

Bulliet concedes that Carpathian miners more likely used pits and trenches rather than tunnels. But he also thinks mine carts may have been hauled by men rather than by animals—another long-held assumption about the development of the wheel. “No yoked team of oxen could have been used in a meter-wide trench, which is what Anthony describes, but a small mine car of the sort I have conjectured might have been,” he says. In view of the wheeled







**DAVID W. ANTHONY**

models and figurines from the time that show animal heads, “maybe some animal-drawn ore cars were used to carry ore from the trench to the smelter,” he adds.

Potts takes issue with this line of argument. “Professor Bulliet cites ceramic vessels in the form of a cart with animal protomes, but notes that these are so stylized that one can gain no idea of how animals may have been hitched to the vehicle. Strictly speaking, this may be true, but I can’t imagine a pair of animal protomes being shown in this way if they were not meant to be draft animals.”

Anthony believes Bulliet’s argument against the wheel’s log-roller genesis is reasonable, but he doesn’t think that the wheelset is the oldest example of wheel technology either—particularly if the wheel’s speculative connection to mining is not accepted. “Circular hubs are found in all of the preserved wooden wheels in the steppes,” he says, noting that two have been radiocarbon dated to about 3000 BCE, and some Western European wheel finds date to 3000–2800 BCE. “So it’s not correct to say that no freely revolving wheels are dated to this early period. All of the model ceramic wheels seem to have circular holes” to revolve freely on an axle, as opposed to a square hole, which would imply that the axle rotated along with the wheels.



**DANIEL T. POTTS**

He adds practical reasons: “Wheels that revolved on a fixed axle had less drag than a revolving axle, so would be more suitable for a four-wheeled wagon, which has more drag than a [single-axle] cart. In addition, freely revolving wheels would make the vehicle easier to turn, so in most circumstances they would work better than wheelsets. The

### WHAT WERE THE FIRST WHEELS LIKE?

Bulliet hypothesizes that wheels initially appeared as wheelsets: pairs of wheels fixed to each end of an axle, with the whole assembly rotating as a unit, much like modern rail cars, rather than each wheel set to rotate independently at the end of its axle. He further asserts that their invention had nothing to do with the log rollers conjectured to have been used in Antiquity for heavy construction.

Robert D. Friedel, a history professor at the University of Maryland, disagrees. “While the connection with log rollers directly is effectively challenged by Bulliet, I have to say that the linkage with these most primitive forms of rollers still seems reasonable,” he says. “Where, in other words, does ‘rolling’ come from—wheel or no wheel?”

Offering evidence from several locales, Potts takes issue with Bulliet’s claim that the earliest wheels were wheelsets. “The ceramic wagon models of the [Carpathian] Baden culture, particularly the example from Balatonberény in western Hungary, show openings for the insertion of axles made of some other material, presumably wood,” he notes.



By about 3000 BCE, Sumerians in Mesopotamia (now Iraq) were making use of the wheel, and it was firmly established by the time this Assyrian relief showing a wagon carrying prisoners of war was carved at Nineveh, in northern Iraq, about 700 BCE.



In the Americas, toy animals on wheels have been found at several pre-Columbian sites, but there is no evidence that peoples there used wheels for any kind of transport or portage; rather, they used llamas and dogs to carry loads and pull sledges.

archeological evidence suggests that both kinds of axle, fixed and revolving, were used simultaneously rather than one preceding the other neatly.”

## WHY WEREN'T WHEELS USED IN THE AMERICAS BEFORE COLUMBUS?

To date no evidence exists that pre-Columbian peoples of the Americas used wheels for transport, even though wheels appear on toy animals found at several locations. This is generally explained as a consequence of the lack of large animals suitable for domestication—a view upheld by historian Jared Diamond in his bestseller *Guns, Germs, and Steel: The Fates of Human Societies* (1997).

This explanation doesn't hold up for Bulliet. “Lack of suitable draft animals does not explain the absence of wheeled transport in the pre-Columbian Americas,” he says, noting that “manpower instead of horsepower” hauled wheeled loads in both pre-19th-century Japan and the Sahel region of Africa, although draft animals were known and available in both places. He also notes that the native population of North America “didn't adopt wagons even after they adopted riding horses.”

Anthony also takes issue with Bulliet on this point, too. He argues that “pre-Columbian America did not host suitable large draft animals for pulling heavy loads on wheels, but did have suitable small animals for pack animals, so pack use was developed for llamas and dogs, and wheel use was not.” Even after horses were introduced to the Americas, “they were used as pack animals, and for pulling sledges [travois] packed with tipi coverings, and for riding,” he adds, explaining that the original Americans “used animal power in the most efficient way that suited their economies.”

## DID USE OF THE WHEEL SPREAD RAPIDLY?

Anthony states in *The Horse, the Wheel, and Language* that regardless of where the wheel-and-axle principle was invented, the technology did spread rapidly over much of Europe and the Middle East between 3400 and 3000 BCE—a view shared also by Piggott.

But Bulliet wonders how this assumption played out in places like Mesopotamia. The first wheels in Europe may have preceded the earliest Sumerian pictograms showing wheels, but the earliest actual depictions of Mesopotamian vehicles bear no resemblance to the designs from the Carpathians or the Black Sea Plain. Moreover, Bulliet notes that wheeled transport existed in Mesopotamia from 3000 BCE but was absent in the contemporary and equally sophisticated Egypt, with which it had regular contact, until around 1600 BCE when the Egyptians adopted the war chariot.

Bulliet hypothesizes that the wheel didn't quickly catch on, nor did it change the world immediately after it was invented. Cross-country wheeled transport did not spread rapidly, and certainly not explosively. In most agricultural lands, roads were almost entirely just well-worn pathways. Bulliet figures that Europeans, in particular, made only limited use of carts and wagons all the way from the end of the Roman Empire in the fifth century to the 17th century CE when aristocracies became enthralled with carriage riding. China adopted the

technology of four-wheeled transport from the Mongols who invaded in the 13th century CE and eventually transferred that technology into the military realm, he says, but no pattern of private use of four-wheeled conveyances by the civilian elite ever developed.

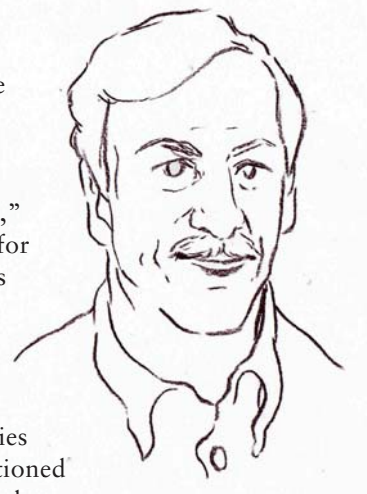
“I have been haunting art museums for several years looking for examples of cross-country or urban wheeled vehicles in paintings and drawings that feature landscapes or cityscapes” from medieval and post-medieval Europe, Bulliet says. “They are exceptionally rare, while pack animals are ubiquitous. Rutted roads indicative of wagon use are also rare. I am certainly not saying that wheels disappeared, only that our contemporary assumption that everyone, throughout history, has always chosen wheels over other modes of land transport because they are an absolute good is mistaken.”

Here, the academics generally agree: Poor roads, or no roads at all, made wheels inefficient. “Roads are notoriously expensive both to build and to maintain,” says Friedel. “While there’s a bit of a chicken-and-egg problem here, it’s reasonable to conclude that wheeled transport of any kind is limited by the conditions of roads. This was true in parts of Europe and North America, and elsewhere, well into the 19th century—or even later.”

**Wheeled transport required good roads—which were few in Europe from the fall of the Roman Empire in the fifth century CE until the 17th century. Only then did aristocrats move from horseback to cushioned carriages.**



Potts points to a centuries-long gap in wide-scale wheel use in Persia. “I have seen countless references in the works of 18th- and 19th-century travelers deploring the lack of roads,” he says. “But I also know, for example, that the Assyrians deployed chariots in their campaigns against the peoples of the Zagros Mountains” during the ninth to the seventh centuries BCE. He says these are mentioned not just in the royal annals, but also in the much more mundane correspondence among Assyrian officials, military commanders and their superiors.



**ROBERT D. FRIEDEL**

Anthony believes wagon transport was widespread in Italy in the Roman era. “I would say that wagons were useful where roads were good or the country was relatively flat, except in sand deserts,” he says. Meanwhile, medieval European manuscripts, tapestries and paintings show wagons being used to carry hay. Covered wagons are shown as coaches for passengers, while carts were used to carry beverage barrels and other heavy loads.

Things began to change in Europe during the 17th century when noblemen gradually abandoned their favor of horseback and took up riding in coaches and carriages. Some two centuries later in England, John Blenkinsop revolutionized carriage transport when he put the first wheeled steam engine on rails. It is perhaps from this point that the modern fixation on the wheel as the world’s greatest invention began.

Why are questions about the origin and spread of such a seemingly simple invention so contested? “The origins of things pose puzzles for us all, and the more fundamental the thing is, the deeper the puzzle,” says Friedel. “Think about debates over the origins of language or writing—and we won’t even try to get close to fire!” 🌐



Writer **Graham Chandler** ([www.grahamchandler.ca](http://www.grahamchandler.ca)) focuses on archeology, aviation and energy. He received his doctorate in archeology from the University of London, and he lives in Calgary, Alberta. **Ivy Johnson** is an illustrator based in New York, where she attends the School of Visual Arts.



**For Further Reading:**

**The Horse, the Wheel, and Language: How Bronze-Age Riders from the Eurasian Steppes Shaped the Modern World.** David W. Anthony. 2007, Princeton University Press.

**The Wheel: Inventions and Reinventions.** Richard W. Bulliet. 2016, Columbia University Press.

**Guns, Germs, and Steel: The Fates of Human Societies.** Jared Diamond. 1997, Norton.

**The Earliest Wheeled Transport: From the Atlantic Coast to the Caspian Sea.** Stuart Piggott. 1983, Cornell University Press.



INTERVIEWED BY  
Johnny Hanson  
IMAGES COURTESY  
eL Seed

**I'm talking** to you, and at  
the same time I'm painting.

**You're painting right now?**

**Yeah, exactly.** I'm talking to you,  
and I'm holding my brush. I'm creating some  
black lines on the canvas.

**Great.**

**Yeah.**

EL SEED SPOKE BY PHONE  
FROM HIS DUBAI STUDIO.

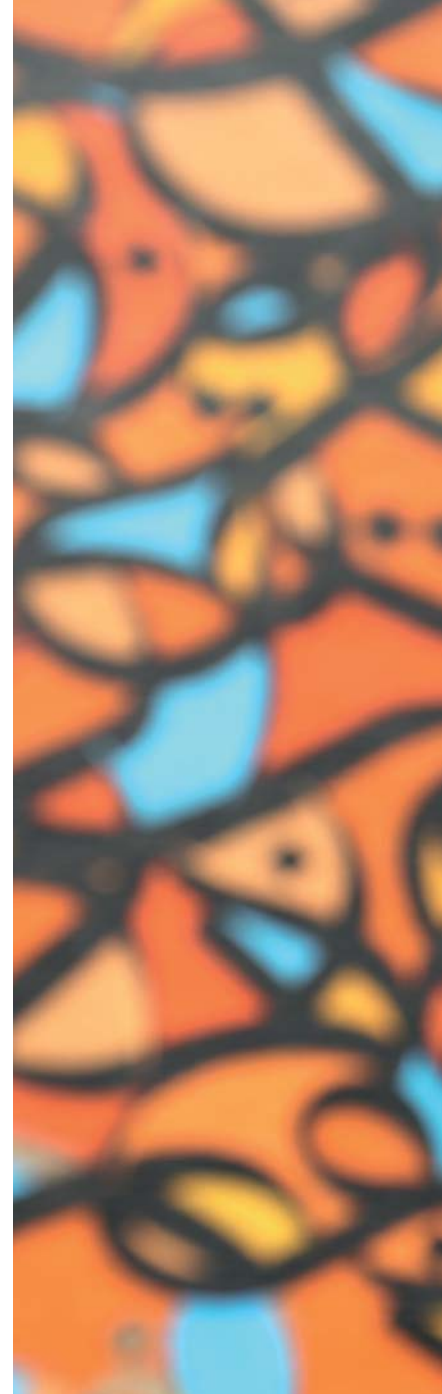
Let's start with "calligraffiti." There are quite a few artists who do it now. Did you coin the term?

No, to be honest with you, this is a term that has been used the first time in New York for a show, I think in '84. A show created by Jeffrey Deitch for some calligraphy artists and some graffiti artists from New York. He had this vision 30 years ago that calligraphy and graffiti would merge together. To be honest with you, me today, I don't even use this word to define myself. I'm just using calligraphy in my artwork. I do sculpture, I do canvases, I do art installations. I'm trying to get out of the box that I think I used to be in a few years ago.

What were you doing before your art became popular, and how has your work evolved?

I have been painting since I was a kid, and my dream back in the day was to be an animator. I know by heart *The Lion King*, *Aladdin*, in French, because I used to rewind all of the time and compose every picture in the movie so I could understand how they make

*Above:* "It's important that each message speaks to the local community but also has a universal significance," says eL Seed, who last year on a facade of the Graduate College of Social Work at the University of Houston, Texas, translated into Arabic and rendered into calligraffiti a quote from city founder Sam Houston: "Knowledge is the food of genius, and my son, let no opportunity escape you to treasure up knowledge." *Opposite:* In 2012 in the Assabah Medina in Tunis, Tunisia, eL Seed painted a quotation from poet Aboul-Qacem Echebbi: "The sun rose behind the centuries."





**Name:** eL Seed is a pseudonym from the Arabic *al-sayyid* (the master)

**From:** Born in 1981 near Paris to Tunisian immigrant parents

**Lives:** In Dubai

**Education:** Master's degree in logistics

**Impact:** His artwork has appeared in 14 countries

**Accolades:** 2017 UNESCO-Sharjah Prize for Arab Culture

2016 *Foreign Policy* magazine artist and thinker of the year

2016, 2015 TED Fellow





animation. I was born and raised in France from Tunisian parents, and I did not read and write Arabic until I was 18. For me it was a quest of identity. I discovered my Arabic roots and embraced the Arabic culture. At some point I stopped painting, and I studied business. I used to have a nine-to-five job that was a bit boring. When I was doing this job, I said that my soul was dying inside. So I decided to go back to painting. I started learning to read and write Arabic, but I couldn't find any teacher to teach me calligraphy. I decided to just reproduce some old calligraphy. I started extending my letters and twisting them and, without noticing it, I created my own kind of calligraphy. I used to paint small walls, and then the small walls, they became a bit bigger and bigger.

Social media helped me so much. I started posting my stuff online just for friends and family to see what I was doing. Step by step, people started telling me, "Oh, I love what you do." Then people started gaining interest that I would never have expected.

#### What is your process for making large-scale works?

I always try to find a way to go beyond what I'm capable of doing. You need the idea and an artistic challenge. I did this project called "Perception," which was a painting on city buildings in the Cairo garbage collectors' neighborhood. I went there without knowing who those people are. I had this small idea about them; that is, they were living in the garbage. And soon I saw that they are not living in the garbage, but they are living from the garbage. That's why the piece is called "Perception"—because they are associated with trash, and everybody throws them away. The piece is over 50 buildings, so you need to have authorization of 50 persons to let you paint their houses. I wanted to convince each person [but it was] the priest [who] managed to convince them, and he opened the door of the neighborhood. We took a picture of the neighborhood, and then I drew the art on some paper that we digitalized. I zoomed in and used every brick—everything I could find—to help me trace my calligraphy. I needed to make sure the first wall matched with the one that was behind it. [But] normally when I do a bigger piece, there is no sketch. It's like I know I'm going to make the shape of the circle, and I just trace it on the spot.

#### You speak French and English too, so why paint only in Arabic?

It speaks to us before it even reaches your eyes. For me it's like music. Sometimes you hear music in a language that you don't understand, but you love the feeling of it. You have no idea what the guy's singing in the song, but you just love it because it speaks to your soul. It was Arabic calligraphy made me accept my French identity, and I realized that Arabic calligraphy placed this bridge between my two identities that I had totally separated. Today I want to use this to create those bridges between people and culture and generations. So, in Houston I was like, "Okay, I need to make something that connects the people to the artist." I cannot just go and write some Arabic poetry on the wall. So that's why I chose this quote from Sam Houston that says, "Oh my son, knowledge is the food of genius, and chase it wherever you are." Something like that. We need to create bridges between people. When we create bridges between cultures, you open a dialogue between them. People often ask me, "What do you love the most about



*Top:* In 2012 eL Seed partnered with French designer Louis Vuitton to create this calligraphic scarf that references a poem about Venice by Taha Muhammad Ali, which eL Seed chose because it "would connect to the story of Louis Vuitton and also the story that I enjoy telling of the Arabs and Muslims and their influence in the world." *Middle:* In 2014 Dubai's Tashkeel Hub hosted eL Seed's first three-dimensional calligraphic exhibit, "Declaration." *Lower:* eL Seed's six-story painting on the Arab World Institute, in Paris, which took him a week to create. "Love is the miracle of civilizations" is the translation of a quote from 19th-century French writer Stendhal. "For me, it summarizes the spirit of the institute, which is to bring cultures closer," says eL Seed.



In his most complex calligraphiti project to date, eL Seed spent much of 2016 painting more than 50 buildings in Cairo to create "Perception." It translates: "Anyone who wants to see the sunlight clearly must first wipe his eyes" —words visible in full only from a single vantage point.

what you do?" What I've realized is that setting up the piece is good, I enjoy painting, but all my pieces at some time will be left here, and the only thing that stays inside is this kind of human experience, meeting people. I think this is what I love the most. Leaving this kind of mark into people's lives because actually so many people leave marks in my life as well.

Now you are doing sculpture, too, and you have worked with the designer Louis Vuitton.

Yes, Louis actually was a few years ago. They asked me to design one of their scarves. Knowing the history of Louis Vuitton's collaboration with artists, for me it was such a huge honor. Being born and raised in France, it was obvious, so I said yes. Now I work a lot more on sculpture, mostly small pieces. My plan is really to work on big sculpture in the public space. Sometimes it's difficult, but if you like the process of making stuff, it is just amazing.

You mentioned building bridges. So tell us more about why that's important to you.

I feel we're in a time today where everything is made for people to ignore each other, to reject each other, to condemn each other. Then we have no idea of who we are. Do you

know what I mean? You base a full opinion on something that you've seen five minutes of on the media, and you never dig deeper to know people. You never try to make a step towards people. I know there's so many stereotypes with Arabic script.

I'm attached to it, and now I'm trying with my art to show a different image and show actually we are connected together. We should embrace our differences. For me, that's the only way to go. That's how you become tolerant, and your mind opens as well. I truly try to achieve that with my work.


How do you want to be defined or known?

Just as an artist who tried to make people dream—who dreamt big enough so people can dream again. 🌍



**Johnny Hanson** is the digital media editor for *AramcoWorld*.

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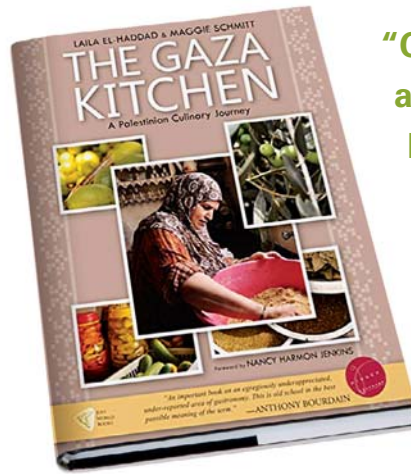
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# REVIEWS & RECOMMENDATIONS

Without endorsing the views of any of the authors, the editors encourage reading as a path to greater understanding.

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**“Cuisine always lies somewhere at the intersection of geography, history and economy. What makes it such a compelling subject is that it serves as a cultural record of daily life for ordinary people ... as evocative and delicious as a steaming plate of stew.”**

## The Gaza Kitchen: A Palestinian Culinary Journey

Laila El-Haddad and Maggie Schmitt. 2016, Just World Books, 978-1-68257-008-1, \$29.99 hb. A Gaza cookbook may seem a frivolous idea for a land of deep political strife. Yet the “clamor of pots,” laughing voices and “the splatter of hot oil” emanating from Gazan kitchens transcend politics. Some of the 140 recipes in this colorfully illustrated volume are predictable: Mjadarra (rice and lentils, a Levantine standard), Felafel and Imtabbel Bitinjan (*baba ghanooj*). Many more are uniquely tied to Gazan history and culture: Ruz eb Maya (chickpeas and rice, “one of the many simple dishes that emerged in the years following the 1948 exodus”); Tagin Samak (poached fish and *tahina* stew), a fish-shack favorite; and Sumagiyya (sumac-infused chard-and-lamb stew), a “quintessentially Gazan” end-of-Ramadan entrée. Just as engaging are sidebars and profiles highlighting home cooks plus purveyors and preservers of Gaza’s culinary heritage. First published in 2013, this updated edition includes new recipes and a renewed dedication to the shared cuisines of the region. —TOM VERDE

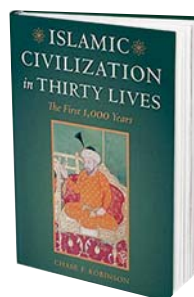


## Children of the Stone: The Power of Music in a Hard Land

Sandy Tolan. 2015, Bloomsbury, 978-1-60819-813-9, \$28 hb. In 1998 Sandy Tolan interviewed Ramzi Hussein Aburedwan, an 18-year-old viola student

who dreamed of building music conservatories throughout occupied Palestine. Ten years earlier, a photo of Aburedwan throwing a stone in al-Fawwar refugee camp on the outskirts of Ramallah had made him a symbol of the First Intifadah (literally “shaking off,” or uprising). Here, Tolan tells the story of Aburedwan’s remarkable transition from a stone-thrower to a talented musician who, against all odds, established the Al Kamandjati Conservatory (which Aburedwan describes as his “musical intifadah”) in 2005. Thanks to Al Kamandjati, hundreds of children throughout

Palestine have learned how to play an instrument and have performed at home and abroad. Yet, “it’s not about making musicians,” says Eric Culver, an American pianist and composer who volunteers at Al Kamandjati. “It’s about improving people’s lives through music.” Tolan’s beautifully written book, which does not spare readers a sobering view of the daily hardships of life under occupation, illustrates the transformative power of music over violence and its potential to protect and offer hope to generations of Palestinian children. —PINEY KESTING



## Islamic Civilization in Thirty Lives: The First 1,000 Years

Chase F. Robinson. 2016, University of California Press, 978-0-52029-298-7, \$29.95 hb. This substantive text takes the “Who’s Who”

approach to history to a higher level. Vast in scope, it profiles

major Muslim writers, philosophers, scientists and political leaders who shaped Islamic civilization from its origins to the height of the Ottoman Empire. Each entry adds insightful context and color while “disentangling the legendary from the reliable.” The life and works of the 11th-century Central Asian geographer-astronomer al-Biruni, one of the world’s first “celebrity-scientist[s]”—centuries before the likes of Carl Sagan or Neil deGrasse Tyson—are examined in detail, while we learn that Marx and Engels both read the 15th-century Tunisian scholar Ibn Khaldun, “one of the pre-industrial world’s most original social theorists.” Here, too, are profiles of important, though perhaps lesser-known, individuals such as 10th-century Baghdadi scribe Ibn Muqla, “a watershed figure in the history of writing styles” and a pioneer of Islamic calligraphy. Colorful illustrations, helpful maps and a glossary, along with suggestions for reading, add to the value of this comprehensive reference work. —TOM VERDE





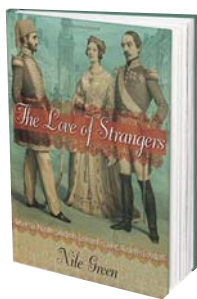
### Kahlil Gibran: Beyond Borders

Jean Gibran and Kahlil G. Gibran. 2017, Interlink Books, 978-1-56656-085-6, \$50 hb.

This is an update of the landmark 1974 work about the poet and artist widely

revered by students and romantics of all ages for *The Prophet*, his book of epigraphic wisdom and spiritual insight. It is by the same husband-wife team responsible for the original volume. Perhaps because coauthor Kahlil G. Gibran was himself a visual artist, the focus is on Gibran's artwork as much as his literary output. The text extends an appreciation of Gibran's oeuvre far beyond his best-known work, with a close reading of art exhibitions, newspaper articles and poems. The reminiscences of family members and friends, access to archives worldwide and support from the Middle East-themed Interlink Books and its ongoing Gibran Project have helped the authors write an essential biography—which also answers the question: How did a Lebanese boy born with the name Jubran Khalil Jubran become known to the world as Kahlil Gibran?

—LOUIS WERNER



### The Love of Strangers: What Six Muslim Students Learned in Jane Austen's London

Nile Green. 2015, Princeton UP, 978-0-69116-832-6, \$35 hb.

If politics makes strange bedfellows, the diary

of Mirza Salih's journey to London is the perfect bedtime story. Salih was among a delegation of six Iranian students who arrived in England in 1815. Chaperoned by Captain Joseph D'Arcy, British military advisor to the shah, the students hoped to study 'ulum-i farang, or "the European sciences," Salih recorded. The idea was to gain knowledge of

"the rising power of the Inglis" at a time when closer ties with Britain and access to Western technology might help Iran fend off Russian aggression. In the ensuing four years, Salih and his companions were fêted by the aristocracy, abandoned by D'Arcy (who had to pay many of their expenses himself) and hosted at Oxford University. There they engaged with scholars and recognized among evangelical clergy many of the same inflexible religious attitudes they knew at home. Nile Green's story of intellectual exchange challenges the "persistent stereotype of European progress and Muslim obscurantism."

—TOM VERDE



### The Optician of Lampedusa

Emma Jane Kirby. 2016, Allen Lane, 978-0-24129-528-1, \$14.95 pb.



### The Bone Sparrow

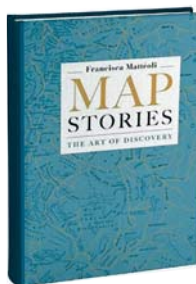
Zana Fraillon. 2016, Disney Hyperion, 978-1-48478-151-7, \$16.99 hb.

These books probe the experiences of modern-day refugees from two distinct perspectives. Emma Jane Kirby, a BBC reporter, gives voice to the real-life experiences of an optician from the Mediterranean island of Lampedusa who

saved nearly 50 shipwrecked migrants from Eritrea and Somalia in 2013. Refugees regularly turn up on Lampedusa, Italian terrain that lies closer to North Africa than Europe. There they are quickly forgotten—until the optician, his wife and six friends on a boating holiday find themselves face-to-face with a sea full of drowning people and fill their craft to overloading. Many more die. Melancholy pervades the last half of the book, reflecting the migrants' broken dreams and their saviors' shattered innocence. Praised for his work, the optician can only say, "I've failed. We've all failed. Us, Italy, Europe—all of us." Zana Fraillon, a children's author, has written an impressionistic novel that will engage adults as well as younger readers. Although her characters are fictitious, they are drawn

from hard facts. The narrator, a nine-year-old Rohingya refugee, lives in a detention camp in Australia where he dreams of the sea he's never seen. His mother and sister fled Myanmar (Burma) before he was born, leaving his father behind. The lad befriends an indigenous local girl who finds her way through the camp fence with a book; he reads her a story about her people's travails and she gives him her bone sparrow charm. Despite his prisoner-like existence, he doesn't despair—his hopes mirrored in the rippling waves of Southern Lights that he spies at the end of the book.

—ARTHUR CLARK



### Map Stories: The Art of Discovery

Francisca Mattéoli. 2016, Octopus Publishing, 978-1-78157-377-8, \$29.99 hb.

This atlas-sized volume takes seven global travel themes, presents 52

ancient map reproductions accompanied by 23 stories and "invites the reader on a journey from map to map, to let their imagination run free," as the author puts it. Her theme works: Readers should particularly enjoy the tales on Petra, the Nile, Aqaba, Madagascar and the Orient Express. In the section on Aqaba, she focuses on T. E. Lawrence's work to mobilize the Arabs against the Turks during World War I, concluding that capturing the old port town on the Sinai Peninsula in 1917 meant "this part of the world map had just been redrawn." Though not intended as a scholarly work, the stories are well-chosen and fascinate despite the some florid prose. The narratives are only loosely connected with the maps, most of which date back centuries, but the maps themselves are superb. This book would be very much at home on a coffee table.

—GRAHAM CHANDLER



### Plagues, Quarantines and Geopolitics in the Ottoman Empire

Birsan Bulmuş. 2012, Edinburgh UP, 978-0-74864-659-3, £70.00 hb.

Despite its somewhat ponderous title, this study

is an exceptionally readable work that explains how, from the 1400s, internal and external forces drove Ottoman public health. Bulmuş exposes the complexity of how public health policy was made through the interactions of variously allied and opposing interests—factors that still pervade decision-making in the field today. Religious officials in the empire relied on Qur'anic passages, while physicians relied on a mix of scholarship, beliefs and empirical facts; business leaders opposed measures that would hurt their bottom lines; and politicians tried not to offend anyone, while their interference was often resented by local citizens. In the end it was the sultan who had the final say, initiating reforms that by the early 19th century included sewage disposal, clean-water systems, quarantine of immigrants and better building codes. A comprehensive bibliography provides a wealth of further reading.

—DAVID W. TSCHANZ



### Science among the Ottomans: The Cultural Creation and Exchange of Knowledge

Miri Shefer-Mossensohn. 2015, University of Texas Press, 978-1-47730-359-7, \$55 hb.

Historians have long argued

that the Ottoman Empire failed to grow scientifically and technologically after the medieval Islamic Golden Age. Innovation was not encouraged, leading to stagnation. Miri Shefer-Mossensohn challenges this perception by comprehensively examining the role of science and learning in Ottoman culture. While not the most creative, the Ottomans were masters of adaptation, turning the inventions of others to their own needs and improving on them. By 1877, for example, they had built a transcontinental telegraph system that "brought a communications revolution throughout the empire," and early in the 20th century they inaugurated the Hijaz Railway, which connected Damascus and Madinah. Absent, however, is a deeper examination of how Ottoman science came to focus more on importing and adapting technologies than on building the research framework to nurture a culture of innovation.

—DAVID W. TSCHANZ



# EVENTS & EXHIBITIONS

Highlights from our searchable listings at [aramcoworld.com](http://aramcoworld.com)



## CURRENT / JULY

**The Islamic Treasures of Africa: From Timbuktu to Zanzibar.** From Dakar to Zanzibar, and from Timbuktu to Harar, this exhibit highlights African communities that have benefited from 13 centuries of spiritual and cultural exchange with the Maghrib (Islamic North Africa) and the Middle East. Focusing on archeology, architecture, intangible cultural heritage and contemporary art, this unprecedented exhibition brings together around 300 multidisciplinary works to shed light on the cultural and artistic richness of the Islamic communities in sub-Saharan Africa. Institut du Monde Arabe, Paris, through July 30.

**When Art Becomes Liberty: The Egyptian Surrealists (1938–1965)**

documents the history and evolution of the works of Egyptian surrealists and their remarkable legacy, both within Egypt and outside among international surrealist circles from the late 1930s to the early 1960s and into the present. It sheds light on the development of Egyptian surrealism, along with its links to international surrealist organizations through its involvement in anti-Fascist and post-colonial movements, providing opportunities for audiences to explore the various aspects of the modern period and interconnectivity among international communities during the 20th century, all while moving away from a Western-centric view by emphasizing the perspectives of non-Western modernism and Egyptian surrealism. National Muse-

um of Modern and Contemporary Art, Deoksugung, Korea, through July 30.

## CURRENT / AUGUST

**Roads of Arabia: The Archaeological Treasures of Saudi Arabia** is the first survey in South Korea of the history and culture of the Arabian peninsula. Tracing ancient incense trade routes and early Islamic pilgrimage roads that once spanned the peninsula, 466 objects ranging from human-shaped steles dating back to the fourth millennium BCE to gilded doors that once graced the entrance to the Ka'bah at Makkah are on display. Organized by the National Museum of Korea with the Saudi Commission for Tourism and National Heritage of the Kingdom of Saudi Arabia. National Museum of

## India Modern: The Paintings of M. F. Husain

is the centerpiece of the Art Institute of Chicago's celebration of the 70th anniversary of India's independence. It presents eight large triptychs from *Indian Civilization* (the first time the series has been displayed in the United States) by India's most important modern artist, Maqbool

*"Modes of Transport,"* M. F. Husain, 2008-2011. Usha and Lakshmi N. Mittal.

Fida Husain, a vital force in the development of Indian modernism. In 2008 London-based Indian art collectors Usha and Lakshmi N. Mittal commissioned Husain, then 93 years old, to create a series of 32 triptychs celebrating India's rich and diverse history and culture, from its earliest civilization at Mohenjo Daro to Mahatma Gandhi. At the time of the artist's passing in 2011, eight had been completed; they were the last works of this modern

master. Interspersed with the paintings are selections from centuries of Indian sculpture that contextualize the paintings within the continuum of Indian art. The experience of these works is further enriched by interpretive elements and diverse programming. Art Institute of Chicago, through March 4.





Korea, **Seoul**, through August 27.

**Les Initiés: Select Works from the African Art Collection of Jean Pigozzi (1989–2009)** comprises works by 15 leading artists from the contemporary African art collection of businessman Jean Pigozzi, and it is presented for the first time in Paris. In 1989 Pigozzi established ties with local artists, subsequently revealing their works of freedom and originality. The Pigozzi collection does not favor a particular medium as it seeks to represent each artist through logical, cohesive ensembles. The artists presented are all heirs to various forms of wisdom—spiritual, scientific, technical—who develop worlds of diverse expression through diverse media. In this sense, they are *initiés* (insiders). Foundation Luis Vuitton, **Paris**, through August 28.

### CURRENT / SEPTEMBER

**Revival.** In celebration of this year’s 30th anniversary of the National Museum of Women in the Arts (NMWA), this exhibit presents contemporary sculptors and photo-based artists whose arresting esthetics and compelling subject matter spur viewers into a transcendent encounter with the art object. These artists favor figurative or highly allusive imagery, yet they center their works on the unconscious, ferreting out the unspoken through disquieting referents such as fragmented bodies, peculiar creatures and wayward children. Featuring works by Moroccan-born

photographer and painter Lalla Essaydi, the exhibition demonstrates how artists engage space to generate intensity. NMWA, **Washington, D.C.**, through September 10.

**Batik Textiles of Java.** The Indonesian island of Java is the principal source of the brilliant textiles known as batiks. The term *batik* derives from the Malay word meaning to draw with a broken dot or line and refers to the wax-resist process by which patterns are imposed on fabric. Many countries, especially in Asia, produce wax-resist textiles, but the Javanese have developed the most sophisticated method for executing the process. Traditionally, women have been the primary producers of batik. Dyeing, on the other hand, is a craft done by both men and women, though indigo-dyeing falls solely to men. The range of patterns, some identified by name, numbers over a thousand. Javanese batik makers have always been open to a broad range of sources for their patterns and motifs: from local Javanese and Hindu works to Chinese, Arabic and Western inspirations. This display features a diverse selection of pattern and functional types, all from the museum’s rich collection, along with materials that further explain the batik process. Art Institute of **Chicago**, through September 17.

**Breeze 2017** by Hungarian-Syrian artist Róza El-Hassan is a search for answers to practical and existential questions about migration, coming home and belonging. She has built

a dome that acts as a model for a community building or school in Syria. Drawings and sculptures are exhibited around the dome. The installation also includes spherical hanging gardens displayed in dew banks, which are mechanisms designed to extract water from the air. The dome stands in the center of a colored orbit representing a design for a real shelter. The “orbit” takes a cosmological round-shaped form, much like the sun with revolving planets. Red Star Line Museum, **Antwerp**, through September 17.

**Toba Khedoori** explores the artist’s nuanced and powerful body of work. Born in Sydney, Australia, in 1964 and of an Iraqi heritage, Khedoori has lived and worked in Los Angeles since 1990. Her early works are notable for their precise craftsmanship and for their use of negative space—often at a very large scale. Khedoori frequently depicts architectural forms from distanced perspectives, rendering commonplace objects and spaces familiar yet decontextualized. In recent years, she has transitioned from paper to canvas, producing smaller-scale works that hover between representation and abstraction. Like her earlier compositions, these works are enigmatic and acutely detailed; in an art world awash with rapidly moving images and saturated colors, Khedoori remains committed to the silent, slow and exacting process of working by hand. The exhibition is the first major museum presentation of Khedoori’s

new paintings and her first survey in 15 years. Pérez Art Museum **Miami**, through September 24.

### CURRENT / OCTOBER

**And The Beat Goes On ... Barkcloth from the Collections of the Weltkulturen Museum.** The designs of cloth, garments and masks manufactured from beaten tree bark are usually based on abstract patterns and geometric structures. Although often associated with the Pacific Islands, the production of barkcloth textiles represents a major craft tradition across the world. Presented here for the first time, the exhibition includes examples of this technique from Oceania, Indonesia, Africa and the Amazon region. As a spin-off to *The Common Thread* exhibit, *And The Beat Goes On ...* takes a fresh look at barkcloth materials. Rather than just a curious legacy of non-European cultures, barkcloth is a multifaceted and vibrant contemporary art form, with this exhibit exploring the traditional and contemporary significance of barkcloth in everyday life, ritual and art. Weltkulturen Museum, **Frankfurt**, through October 1.

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**AramcoWorld (ISSN 1530-5821)** is published bimonthly by the Aramco Services Company, 9009 West Loop South, Houston, Texas 77096-1799, USA.

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