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Petrodollar Science

Waleed Al-Shobakky

Oil executives are rarely assigned to establish universities. But when the unlikely call arrives, some hardly pause to ponder the unconventionality of the assignment. So, only five minutes into the meeting that brought him together with leading individuals from Carnegie Mellon University, Nadhmi Al-Nasr, vice president of Saudi Arabia's state-owned oil company Aramco, did not mince his words: "It is perhaps unusual that an oil executive is starting a university. But given your experience in Qatar, would your university be willing to help us build a new research university in Saudi Arabia?"

It was over dinner in Pittsburgh on a spring day in 2007, joined by a host of high-ranking officials from Aramco, that Al-Nasr—then the interim president of King Abdullah University of Science and Technology—posed the question to his host, Carnegie Mellon president Jared Cohon. "It is anyway easier than a university president starting an oil company," quipped Cohon.

"That was a funny retort," Peter Lee, head of Carnegie Mellon's computer science department, told me recently, recalling the encounter. "It does point out, though, how unusual the situation is, where oil executives are delegated to establish an academic institution."

Yet as odd as the encounter may have seemed, it was symbolic of a growing trend. Ever since oil was discovered in the Arab lands at the beginning of the twentieth century, it has permeated every facet of life there. Oil wealth has dramatically raised the standards of living in some Arab countries, particularly the Gulf states, catapulting one of them (Qatar) to the top of the list of countries with the highest GDP per capita in 2007. But oil wealth has also been a mixed blessing, propping up unelected regimes and causing wars in the region, such as the Iraqi invasion of Kuwait in August 1990.

And most notably, over the past three decades the oil wealth has been shifting the centers of gravity in the Arab world. Rather than Damascus and Cairo, once recognized as major centers of culture and influence,

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younger and more vibrant Gulf capitals like Doha and Kuwait City are increasingly attracting the best Arab minds. Traditionally, the most progressive initiatives often arose from the heart of the Arab world—Egypt and the Levant—noted Saad Eddin Ibrahim, a prominent Doha-based Egyptian-American sociologist, in an interview. But "the heart turned sclerotic; the good ideas now come from the peripheries, the Gulf to the east and North Africa to the west, countries like Qatar, Kuwait, Mauritania, and Morocco."

Alarmed by the prospect of running out of oil (or the development of an economically viable alternative), the Gulf states are now pouring substantial amounts of their "petrodollar" windfalls into science and education projects: a $10 billion endowment for King Abdullah University of Science and Technology, an $8 billion endowment for Qatar's Sidra Medical and Research Center, to name just two examples. Concern over oil is not the only reason, however. A widely acknowledged demographic problem and a desire to improve their economic prospects and international image both contribute to Gulf states' new enthusiasm for high-quality education. But if only evolving home-grown science were merely a cash problem.

As the Gulf countries set out to change their education systems and erect modern, high-standard science and research institutions, they are confronted with a broad array of hurdles, old and new. The central problem, however, remains how to engage Western academia in growing science in the Arab world, so that the region transitions from the "initiatives" phase to one in which a permanent, thriving, organic scientific community takes root—that is, in the words of Ibrahim, to turn initiatives into institutions, a transition somewhat like the one China is undergoing today. How the Gulf countries, employing their different philosophies, address this challenge will largely determine the fortunes of their new science projects.

Of Shocks and Booms

Ask the many expatriates working in Qatar's new science and education projects what attracted them to the Gulf state, and you will likely hear a variation of the following: "This time around, Qatar has all the elements of success in place." So says, for instance, the director of Qatar National Research Fund, Abdul Sattar Al-Taie, an Iraqi national. But while this assertion is debatable, it invites comparison with an earlier era when only *some* necessary pieces of the modernization puzzle were available—that is, the mid-1970s, when oil prices tripled almost overnight.

The jump in price was the result of the embargo that OPEC, led by Saudi Arabia, imposed on the countries that supported Israel in the Arab-Israeli War of October 1973. That was the first oil shock Europe and America experienced. But in the Gulf countries, it was the first oil boom. It brought unprecedented petrodollar windfalls to the Gulf states—states that were newly independent. To be sure, Kuwait, Saudi Arabia, and the "Trucial States"—today's United Arab Emirates, Bahrain, and Qatar—had had varying degrees of sovereignty for decades. Agreements between these states (which were part of the Ottoman Empire) and the British Empire in the late nineteenth and early twentieth centuries had brought them under its protection in return for forgoing their foreign policy and most of their control over natural resources.

That came to an end as the declining British Empire decided in 1968 to discontinue its presence "east of Suez" by 1970. By the end of 1971, Bahrain, the United Arab Emirates, and Qatar became officially independent. Less than two years later, the Gulf states, particularly Saudi Arabia, would leap onto the world stage with the oil embargo—an unmistakable signal to Europe and America that oil supplies could no longer be taken for granted.

In the following decades, several more oil shocks (or booms) would occur, but the flow of the sour crude and the sweet green between the Gulf states and the West never stopped. In 2008, thanks to months of record oil prices—peaking at $147 per barrel in July 2008—the combined GDP of the Gulf Cooperation Council (Saudi Arabia, Qatar, Bahrain, Kuwait, the U.A.E., and Oman) is set to break the $1 trillion barrier for the first time. Still, oil producers had their share of devastating shocks too, when oil prices plummeted in the mid-1980s and mid-1990s.

So when Al-Taie and others reckon that this is the optimum moment for science to take off in Qatar and other Gulf states, what do they believe was missing during the first and second oil booms in 1974 and 1980? In the Gulf of the 1970s, the basic apparatus of the state—roads, hospitals, schools, communications infrastructure, and the military—was still very primitive, according to Ibrahim Oweiss, an economics professor at Georgetown University in Qatar. Much of the oil proceeds of the past two oil booms went into building the state and providing for its extensive social welfare programs. With those structures in place, the Gulf states are now investing in high-quality education and science, added Oweiss (who coined the term "petrodollar" in a 1974 paper).

There is also a new sense of urgency in the leadership circles of the Gulf countries. The past decade has witnessed significant global and

domestic developments, including the rise of India, China, and other Asian countries such as Singapore—a rise largely powered by a high-quality workforce (as opposed to a high-priced natural resource). Then there is the increasingly acute realization that outdated and inefficient education leaves gaps that can be filled with fundamentalist ideologies, threatening both the ruling regimes in the Gulf countries and the lifeline of their economies—oil. The 2003 terrorist attacks in Riyadh drove this point home.

In light of these developments, high-profile scientific research and education projects come as "political statements from the top," said Tidu Maini, chairman of Qatar Science and Technology Park, in an interview. Maini, former pro rector of the Imperial College London, notes that the new science and education projects in the Gulf do not necessarily indicate that Gulf leaders have suddenly turned into staunch science supporters, but rather that they themselves are not happy with the stagnation in the region and are interested in bringing about change.

One of the changes already taking place concerns the belief in the infinitude of oil supplies. Despite the vast Saudi oil reserves (about 264 billion barrels) and Qatar's immense natural gas reserves, leaders of both countries are starting to come to terms with the simple fact that the fossil fuel supplying their wealth is a finite resource. Thus they are looking to use the revenues from this oil boom more prudently than in the past. One manifestation of the new wisdom is the establishment of sovereign wealth funds that target high-profile assets in the United States and Europe, such as the purchase of a 5 percent stake of Citigroup in November 2007 by the government of Abu Dhabi (one of the seven emirates constituting the United Arab Emirates). But more importantly, as part of this effort to think for the long term, Saudi Arabia, Qatar, and the U.A.E. are all investing in education and science projects for the post-oil era. In pursuing this goal, they are enlisting the support of Western academia.

Cornell Goes to Doha

Last spring, in addition to its regular commencement on its campus in New York state, Cornell University also held a graduation ceremony seven thousand miles away, at Qatar's Education City, where Cornell set up a branch of its medical college in 2002. Within walking distance from the Ivy League university's branch stand branches of five other American universities: Virginia Commonwealth University School of the Arts, Texas A&M's school of engineering, Carnegie Mellon's schools of

business administration and computer science, Georgetown's School of Foreign Service, and Northwestern's Medill School of Journalism.

In nearby Abu Dhabi, Paris-Sorbonne University started operations early in 2006. And by 2010, according to the *New York Times*, Abu Dhabi will be home to a full-fledged branch of New York University. Across the border from the U.A.E., Saudi Arabia's ambitious King Abdullah University of Science and Technology is a graduate-level research university that has struck partnership agreements with respected universities in the United States, the United Kingdom, India, the Netherlands, Egypt, Italy, and Taiwan.

At a glance, these initiatives may seem similar: petrodollar-flush Gulf countries pursuing renowned (albeit often cash-strapped) universities for collaboration. Yet three quite distinct models of collaboration with Western academia can be identified in the Gulf: the branch campus model of Qatar and Abu Dhabi, the "non-exclusive partnerships" model of Saudi Arabia, and the entrepreneurial model of Dubai.

In Qatar, the Education City is the cutting-edge venue of the branch campus model. The City is the flagship project of Qatar Foundation (QF), which was founded in 1995 by Qatar's emir, Sheikh Hamad bin Khalifa Al-Thani, shortly after he rose to power in 1995. At the 2,500-acre campus, where the six American universities mentioned above have set up shop, the stated mission is to replicate the educational quality of the parent campuses and offer the same degrees.

Mohamad Fathy Saoud, president of QF, is quick to note that he and his team did a good deal of tweaking and fine-tuning to the branch-campus model. In an interview, Saoud said that in an earlier branch campus model, one tested by China and Japan after World War II, only small universities established branches abroad. That was not Qatar Foundation's goal. The QF team approached the world's top universities—including Oxford, Harvard, Cambridge, and M.I.T.—for Doha branches, but was met with polite refusals all around. So QF went back to the drawing board in hopes of figuring out the right formula to click with the top universities. "It was a very instructive, if at times disappointing, experience," Saoud said, recalling the initial negotiations between QF and Western academia in 1996 and 1997.

In listening to the concerns of top American and British universities, QF learned to refine its approach. One of the reasons cited for declining the invitation was the sustainability of resources. "They were openly skeptical about how serious we were and how such projects, if begun, would continue," Saoud said. Another source of concern was the autonomy of

the branch campuses and academic freedom. And then there was the question of how Qatar, with a population of only 300,000 (and about twice as many expatriates) was going to provide enough students to meet the high standards of top universities. In response, QF put in place new rules of engagement. First, a fund was established to secure a sustained resource to provide for QF's education projects. Saoud said that QF sought to assure potential partners that a branch campus would entail no financial risk to the parent institution. All expenditures, salaries, and upfront payments would be shouldered by Qatar. Second, new rules were adopted that guaranteed the autonomy of the universities agreeing to branch out in Qatar. Finally, QF introduced an extensive scholarship and financial aid program to allow students from around the world to apply to Doha branch campuses.

The first hopeful sign came in 1997. Approached by QF for collaboration, the University of Virginia offered to provide all the degree programs QF wanted: medicine, engineering, political science, and more. That was good news to the QF team, but this time *they* had to give the polite refusal. "The University of Virginia is a great institution, but we wanted to make sure that not only the universities we partnered with had good rankings, but more importantly [that] the programs themselves [were] highly ranked," said Saoud. "So we discontinued the negotiations midway through."

The major boost came in 2001, when Cornell University reversed its earlier refusal and accepted QF's invitation. Cornell, an Ivy League university among the best ranked in the United States, was a breakthrough for Qatar. "Signing up Cornell made it quite easier for us to make the case for a Doha branch to other universities," Saoud said. But the accomplishment did not come cheaply: Qatar Foundation is reported to have paid about $800 million up front, in addition to benefits to faculty and staff and an undisclosed sum annually.

Today, four of Education City's six schools are branches of the top twenty-five universities in the United States, according to *U.S. News & World Report*'s 2008 university rankings.

Still, there is no guarantee that the branch campus model itself will turn out as hoped. In fact, a host of innate deficiencies may impede the Education City's success. First, the most elite universities continue to shun branch-campus agreements. Commenting on the reluctance of the top ten universities to engage in establishing branch campuses, M.I.T. chancellor Phillip Clay said in an interview, "Great universities have features which are really very hard to move even a short distance from their home communities. [Our] notion is that distance creates an estrangement

from the energy which we believe is critical to the intellectual development of young people, the students."

Tidu Maini, of Qatar Science and Technology Park, agrees that the branch campus model is unlikely to attract a Yale or a Princeton. But he notes that "whether Qatar or the U.A.E. necessarily need these top universities at this stage in their development is an open question."

Another shortcoming of the branch-campus model is that it leaves unanswered a critical question: will the faculty from the parent school go and teach at the new outposts? Ideally, faculty would move back and forth between the parent and branch campuses. In reality, however, most faculty are reluctant to move to the branch campuses. So the branch campuses often resort to recruiting faculty from outside the parent institution, or locally from the expatriate community. And some of the Education City campuses were indeed reported to have problems enticing their faculty from the United States to teach in Qatar. That essentially creates "second-tier branches, with second-tier faculty. So you end up replicating mediocrity," said M.I.T. associate provost Philip Khoury.

The unwillingness of M.I.T. and others to embrace the branch-campus model is, however, not a dismissal of the increasingly globalized character of higher education. "I think all of us [top American universities] are interested in becoming involved [in international collaboration]," said Khoury, who oversees M.I.T.'s global initiatives. "The question is, in what way?" Thus far, M.I.T.'s favored way is collaboration on research projects. "We are much better at looking for collaborative research opportunities than trying to create 'M.I.T.s abroad,'" Khoury said. Some of these collaborative projects were with partners in the Arab world, including Cairo University and Kuwait University. And now M.I.T. is involved in a project with Al-Masdar Energy Institute of Abu Dhabi.

Yet even in collaborative research projects, M.I.T. is moving at a slow pace. Clay noted that it all comes down to the question of how many faculty members can leave Boston to pursue the research projects that excite them before the departures diminish the quality of education at the parent campus. He added that M.I.T. has about a thousand faculty members—a number that, he said, has stayed the same over the past twenty-five or thirty years.

To address this concern, Abu Dhabi promised New York University "to replace whatever the New York campus loses to the Gulf," the *New York Times* reported in February 2008. So if 10 percent of, say, the political science department faculty decide to teach at the U.A.E. campus, the government of Abu Dhabi will pay for growing the political science

department back in New York by 10 percent. That arrangement may satisfy university administrators, but it hardly tackles the deeper question of how to lure reluctant faculty who do not see in the emerging Gulf cities a match for the professional communities they are familiar with in the United States or Europe.

In addition, there is the explicit desire to maintain the brand. That is especially true as education is becoming a global enterprise. Small, ill-advised projects can tarnish a great institution's reputation. M.I.T. itself has had its share of this with its Media Lab Europe and Media Lab Asia adventures in Ireland and India, respectively—both failed projects. Hence the institution has resolved to follow the research interests of its faculty. "We are reluctant to commodify research," Clay said. "That is, we do not think you can simply go out and buy a relationship. Relationships have to be organic, sustainable, and stem from mutual research interests."

Qatar and the U.A.E. are therefore left in a curious situation: while their branch campus model benefits from the globalization trend in education, top-ranked schools remain largely aloof, and it is second- and third-tier universities that are the most aggressive globalizers. "It's precisely because we're third-tier that I have to find things that jettison us out of our orbit and into something spectacular," Dawood Farahi, president of Kean University, told the *New York Times*. Kean is a New Jersey public university in negotiations with China and other countries over branch campuses.

In Saudi Arabia: Non-Exclusive Partners

As Qatar was developing its model, Saudi Arabia was watching. And in July 2006, the largest Arab country in Asia announced its own education mega-project—King Abdullah University of Science and Technology (KAUST)—set to open in 2009 with an endowment, at $10 billion, as vast as M.I.T.'s. But the size of the university's endowment is not its most significant feature.

The way KAUST is set to work is novel on various counts. The underlying theme is an attempt to engage Western academia on its own terms, and an acute attention to the shortcomings of the branch-campus model. Instead of aiming for full-fledged branches like its smaller neighbors, Saudi Arabia is opting for non-exclusive partnerships. With ample money to spend, KAUST is inventing new collaboration schemes. Chief among them is the Global Research Partnership (GRP), the university's "primary mechanism for initiating research programs for its faculty and students," according to the KAUST website. In the GRP (modeled after the Howard

Hughes Medical Institute), researchers from around the world can apply for grants. Those whose proposals are accepted receive funding of up to $10 million to do their work at their home institutions. In return, grant recipients will be expected to visit Saudi Arabia for two or three weeks annually to participate in workshops and seminars with KAUST's students and faculty. These grants will go to researchers working on areas of relevance to the university's mission: energy and the environment, biosciences, materials science, and computer science.

Grant and scholarship programs (similar to National Science Foundation schemes) are also underway for faculty researchers, research teams, institutional research partners, and undergraduate students planning to join KAUST. On a parallel route, the university's leadership (most of whom are former high-level administrators at American universities and research institutions) are hard at work signing up institutional partners. Thus far the list includes the University of Texas, Cornell University, the Imperial College London, National Taiwan University, American University in Cairo, and Utrecht University, among others.

Among the more eye-catching features of KAUST is that it will be the first coed institution in Saudi Arabia. On the education side, KAUST is organized into multidisciplinary "research institutes" rather than the traditional "schools," which continue to be the favored operating units in the branch-campus model.

At the first GRP awards ceremony in Jeddah last May, Shih Choon Fong, founding president of KAUST, drew a contrast between his university's model and the branch-campus model. Calling it the "multinational corporation model," Shih described the branch-campus strategy as a remnant of the past. "Leading up to and into the twenty-first century, universities seeking to extend their global reach began setting up overseas satellite campuses," he said. "These universities generally brought their own intellectual and cultural DNA to the outposts. This strategy… often involved an unbalanced arrangement, sometimes to the disproportionate advantage of the parent institution." KAUST's philosophy, by contrast, is at the "leading edge" of the twenty-first-century "paradigm shift": "Building on multiple levels of partnerships, ranging from those between individual researchers to institutional partnerships," Shih said. "Our strategy crisscrosses disciplines, cultures, and continents."

Creative as they may be, KAUST's lofty plans were greeted with skepticism from different quarters. Most doubters are unable to reconcile what they know about Saudi Arabia with these progressive plans. And the fact that KAUST's advisory board brings together such eminences as

the former presidents of Cornell University and the National Academy of Sciences seems to have done little to allay the concerns.

"The university sounds wonderful on paper, but I am skeptical it will bear fruit," Nader Fergany, director of the Almishkat Center for Research in Egypt, told *Nature* in February 2007. "Saudi Arabia has produced expensive white-elephant universities before," he added, citing the King Abdulaziz City for Science and Technology, established in 1977, which did not contribute in any significant way to advancing science in Saudi Arabia. Fergany also expressed his doubts that the Saudi regime "would deliver on its promise of autonomy," remarking that the first test would be whether Saudi Arabia was ready to install a non-Saudi as the founding president of the university. (KAUST passed this test by hiring Shih, who is a Harvard-trained Singaporean.)

And at the universities with which KAUST sought partnerships, skeptical faculty members were far from subtle. When Peter Lee, head of Carnegie Mellon's computer science department, shared on a university website some details about talks between KAUST and his institution, the comments were overwhelmingly negative. A self-identified "skeptical faculty member" described Saudi Arabia as a "corrupt monarchy with an atrocious civil rights record." Another said the financial side of collaborating with KAUST was "exciting," but Carnegie Mellon had to do "the right thing." The most furious comment came from a self-identified staff member: "For the first time in two decades at CMU, I'm ashamed of this institution for even considering working with the Saudis. No written requirements for equal participation can change the nature of the Saudi society. Until they change, we need to pass on such associations."

Lee acknowledges that the extremely unfavorable image of Saudi Arabia in the West, particularly the United States, will negatively impact partnership plans between KAUST and Western academia. And there are other obstacles ahead. KAUST's collaborative research agreements come with minimal strings attached, which could prove attractive for researchers, but may not necessarily offer the best possible value for money the Saudis can get. But then, Saudi Arabia is such a wealthy country that the entire university endowment is just a tiny chunk of its annual oil revenues ($194 billion for 2007, according to the U.S. Energy Information Administration). "Instead of spending it on more palaces and Rolls-Royces, it is good they are investing in education," said M.I.T.'s Khoury.

Another potential weakness of the Saudi model is the very feature KAUST's president considers a strength: the non-exclusive nature of its collaborative agreements. "In the branch-campus model," Qatar

Foundation's president said, "partner institutions are committed to a long-term relationship." Thus the host country can use the graduates from those programs as a "new core of leadership," Mark Kamlet, Carnegie Mellon's provost, told me. In the Saudi model, by contrast, neither individual researchers nor research institutions have any commitment to KAUST. And any tensions between Saudi Arabia and the countries hosting its partner institutions may have a higher adverse impact on the collaborative projects than would be the case in branch-campus agreements.

Even if the Saudi model overcomes the reluctance of Western academia, there remain more obstacles at home. In July 2008, Mohammed Ben Yehia Nogeemy, a member of the Saudi Juristic Academy, a religious organization, told the *Los Angeles Times* that the "establishment of a coeducational university…will be a big mistake that will need to be corrected." Nogeemy said he was not against embracing science, partnering with Western science institutions, or having Western male professors teach in classrooms of females. But to have males and females in the same classroom was just more than he could tolerate. And Nogeemy is surely not alone in taking this stance. According to the *Times* story, KAUST was at the center of a raging online debate between the ultra-conservative camp and more reform-minded camp (to which Saudi King Abdullah is believed to belong).

Dubai and the Entrepreneurial University

To the east of the vast landmass that is Saudi Arabia rests the United Arab Emirates, a union of seven emirates that came together in 1970. While the union proved a success, each emirate retains to a large degree its pre-union character. Dubai, for instance, remains what it has always been: a trading city.

Dubai has shot from relative obscurity to stardom in a rather short time. A port city, Dubai has traditionally lived off and thrived on trade, particularly pearl fishing until the early 1900s (when the Japanese managed to trick oysters into producing "cultured" pearls, upending the traditional "natural" pearl industry). Oil discoveries in the 1960s and complete independence from Britain in 1971 conferred more importance upon the strategically located city. In the early 1980s, Dubai experimented with the free-trade-zone concept (that is, no customs or taxes on goods or companies) in its Jebel Ali port and industrial center. That proved to be a brilliant move, attracting dozens of multinational corporations to set up Dubai branches in the 1980s and 1990s. With the dawn of the new millen-

nium, Dubai grew more ambitious, setting up a series of free-zone "parks": the Internet City, Media City, the Outsource Zone, and others.

By 2003, Dubai, increasingly a regional trendsetter, decided that the time was ripe to plunge into the higher education fray. The government's investment arm established the "Knowledge Village," aiming to make it a "destination for learning excellence." And indeed, universities from the United States, the United Kingdom, India, Pakistan, and Australia established branches on the new campus. Dubai's leadership saw in higher education a business with a growth potential, particularly in the aftermath of the September 11, 2001 attacks and the stringent visa requirements that were put in place for students from the Middle East.

When Dubai opened the doors of its Knowledge Village, it expected business partners. The universities that have opened branches at the Knowledge Village—including Mahatma Gandhi University, Middlesex University, and the University of Wollongong—are profit-seekers that saw in Dubai an opportunity to tap the oil-rich Middle East. In other words, Dubai's universities are more or less entrepreneurial entities, with all that this entails. There are hardly any entry criteria, nor is there a nationwide accreditation system. The free-zone's approval is good enough. That stands in sharp contrast to Qatar and Saudi Arabia (as well as Abu Dhabi), which cherry-pick their education partners. And once the Knowledge Village schools are up and running, they are all on their own.

It is no surprise, then, that the focus of these universities is on business and computer science—programs that are in high demand in the region and fairly inexpensive to offer. Still, some of the Knowledge Village ventures could not survive and called it quits, reducing the number of Dubai's campuses from nineteen to thirteen over the past two years. Sitting in his office in Doha, Texas A&M Associate Dean James Holste told me that the more lucrative Qatar arrangement, unlike that of Dubai, freed its partners to worry about "quality, not survival."

In an interview, David McGlennon, former research director at the U.A.E.'s Zayed University, said that the shortcoming of Dubai's education projects is that they stem from a business rather than an education strategy. This strategy is based (to use the business lingo) on aggressive market-share tactics. In February 2005, the Dubai government's investment arm established DuBiotech, with a fund of $400 million, to become, as its website puts it, "the Middle East's first and foremost science and business park dedicated to global life science." But many believe that DuBiotech is tilted much more towards business than science. "There is some truth in this," said DuBiotech director Abdul Qader Al-Khayyat,

adding that Dubai's philosophy is to start the industry as soon as possible, and then evolve it with time. And he counseled that observers should not hasten to reach conclusive opinions about the parks yet. "Dubai's parks have not taken on their final character yet because they are all nascent."

McGlennon also noted that as far as education and research were concerned, Qatar was in a better position than the U.A.E. because the former has developed a "national priorities" plan. Part of the reason why it is more difficult to devise a single strategy for the seven emirates is that each has its own ruler (often from the dominant family from the pre-union era) and its own government, and they vary in natural resource endowments. Thus, whereas national strategies exist for elementary and secondary education, tertiary education remains an open field for each emirate to experiment as much as its means afford (though all universities are open to all U.A.E. citizens). Ras Al-Khaima, one of the emirates, invited George Mason University in 2005, and despite difficulties hiring faculty from the parent campus and the lukewarm demand, the American university continues to operate, supported by the emirate's government. Far to the south of Ras Al-Khaima, Abu Dhabi is engaging in what are probably the U.A.E.'s most ambitious projects, New York University of Abu Dhabi and the Sorbonne branch in Abu Dhabi—not only because of their scale, but because both campuses are focused on the liberal arts. And that is a marked departure from the engineering-business-computer-science trio that has hitherto taken the lion's share of education initiatives in the Gulf.

Science of Change

Despite the divergent paths the Gulf countries are taking, all their new initiatives share a crucial feature: a better grasp of how Western academia works. Dubai has identified a trend in higher education as a service for which there is evident demand, as well as plenty of suppliers. Doha and Abu Dhabi have discerned a new impulse on the part of Western academic institutions to go global in search of fresh talent pools and new sources of income, as well as to boost their international rankings. And Riyadh has realized that top schools are less inclined to make clones of themselves abroad than to participate in collaborative research programs.

This understanding was evidently lacking in earlier Arab science initiatives. A testimony to that is the current Arab science landscape; it is sprinkled with relics of the half-hearted projects of the 1970s and 1980s. One instructive example is King Abdulaziz City for Science and

Technology (KACST). Established with great fanfare in Riyadh in 1977, the institution's mandate was to propose policies for advancing science and technology in Saudi Arabia, to conduct and support scientific research, and to "foster international cooperation in science and technology." The implementation, however, was a different story. Farouk El-Baz, the Egyptian-American geologist who now heads Boston University's center for remote sensing, said in an interview that instead of aiming for the best talents as had been planned, the Saudis filled the ranks with low-paid, subscale researchers and administrators.

Another example is Kuwait Institute for Scientific Research (KISR). It was established in 1967 by the Japanese as part of the concession agreement with the government of Kuwait that led to the founding of a joint oil company. In 1973, KISR was reorganized and came under the direct guidance and review of the council of ministers. The Kuwaiti institute too sought to "establish and foster relations, and carry out mutual research with higher education institutes and the technological and scientific sectors in Kuwait and [other] parts of the world," according to KISR's website. But then the institute was "managed and staffed mostly by Kuwaitis, with little to show in scientific research," El-Baz said.

Between KACST of 1977 and KAUST of 2007, the Saudis have learned more about how to engage with Western academic institutions. From the very beginning, KAUST was clearly following a different playbook. An international advisory council of eminent individuals—including the rector of Imperial College London, the former president of the National Academy of Sciences, and the chancellor of the University of California at San Diego—was assembled to offer guidance on the university's founding plans and documents. Instead of hiring a Saudi as KAUST's first president, the interim leadership hired Shih Choon Fong. And unlike other Saudi universities which are run by the ministry of education or report to the council of ministers, KAUST's operations will be reviewed and guided by "an independent, self-perpetuating board…in control of the founding endowment," according to Lee of Carnegie Mellon. Finally, KAUST is setting two precedents: coed classes, and opening up KAUST's grants and scholarships to researchers of all religions and nationalities, including even Israel—though without any formal cooperation between the university and Israeli institutions.

So what is orthodox Saudi Arabia's motivation in adopting novel ways? Chiefly a hope that scientific progress may potentially translate into economic and social development, and a belief in the importance of being more attractive to scientists and science institutions from all over

the world, particularly the West. In the first and the second oil booms in the mid-1970s and early 1980s, Saudi Arabia and the other oil-rich Gulf countries were confident that with their abundant petrodollars they could afford to buy anything Western civilization has ever produced. This certainly worked with cars, VCRs, and airplanes—but not with academia, and not with scientists. Thus, with the third oil boom, the Gulf countries are offering more than their oil wealth in the attempt to evolve home-grown science institutions; they are nurturing a fresh willingness to adopt the methods of those they are asking to help.

This help is increasingly critical as the "demographic crisis"—a problem oil money cannot readily address—manifests itself. In *Saudi Arabia Enters the Twenty-First Century* (2003), Anthony Cordesman of the Center for Strategic and International Studies writes that "Saudi Arabia should face the fact that its most serious threat is its own population growth.... The royal family and the people of Saudi Arabia must come to grips with the fact that the Kingdom...faces a potential demographic crisis." Citing World Bank statistics, Cordesman notes that the Saudi labor force grew from three million in 1980 to seven million in 2000, and is expected to reach ten million by 2010, at an estimated annual growth rate of 3.4 percent from 2000 to 2010.

This growing labor force means that the Saudi economy needs to furnish almost one million new jobs annually. But this is a tall order, especially for an economy heavily dependent on the oil industry and notorious for subsidizing highly inefficient sectors, such as agriculture. And the country's demographic lopsidedness (more than 60 percent of Saudis are under the age of 25) combines with other factors—such as largely outdated education, the absence of political participation, and the lack of a free press—to leave the country with a large youth population susceptible to militant ideologies.

The demographic boom appears to have been on the mind of the Saudi leadership since the late 1970s. But it was May 12, 2003 when the crisis grabbed the leaders' attention with a vengeance. Suicide attacks targeting housing compounds of Americans and Britons in Riyadh—and prompting the United States and Britain to temporarily shut down their embassies—abolished any lingering doubt about how serious the demographic problem was to the regime, to the Saudi economy, and to the country's regional and international standing. The Riyadh attacks demonstrated in unambiguous terms the extent of damage that a relatively small number of disaffected youth, brainwashed by extremist ideologies, could inflict upon a country as wealthy as Saudi Arabia, and a regime as controlling as

the House of Saud. To the Saudi leadership, therefore, the choice was, in effect, between bracing for the next explosion and voluntarily initiating changes that could offer ways to defuse the demographic bomb. A massive and novel high-education project sounded like the kind of change that could help.

Such change would have set off many more alarms had it been in any other area than science. "The methods of science are really independent of culture," said James Reardon-Anderson, dean of Georgetown's School of Foreign Service in Qatar. "That objectivity helps it cut through cultural differences, and makes it necessary for everyone to play by the same rules. Science has that virtue."

Equally important, if KAUST proves successful, its innovations are unlikely to remain exclusive for long. "A KAUST success will put extreme pressure on other universities to follow suit," Lee said. He noted that King Fahd University of Petroleum and Minerals is probably the best university in operation in Saudi Arabia, but it is closed to women. KAUST may change that. In fact, if its plans pan out, KAUST could prod other Saudi (and Gulf) universities and institutions into revisiting their ways and raising their standards to be able to compete.

Science and the City

Another striking common element among the recent education and research initiatives in the Gulf is that they are all happening inside gated communities. "If you look at the experiments in the Gulf, one thing that gives you a pause is the degree to which they have had to be created in boundaries," said Reardon-Anderson. "[Qatar's] Education City has a boundary around it. King Abdullah College [in Jordan] has even more boundaries." And so does KAUST, the campus of which is built on the remote shore of the Red Sea, and which will even have its own airport.

That is a noteworthy trend—and not just because of the symbolism. First, it shows that even as the Gulf leaders demonstrate multibillion-dollar enthusiasm for science and education, they are treating their projects as *controlled experiments*. Wary of a nationwide backlash against KAUST's coed classrooms, or the explicitly Christian-Jesuit character of Georgetown's Education City branch, Saudi Arabia and Qatar have made sure the walls around their young initiatives are high and strong.

The boundaries around the new projects may shield the larger society from a potential culture shock. But they also block what could be a fruitful interaction between the new centers of education and science and

the host society and its institutions. Thus the exchange of ideas and the engagement in debates remain largely locked up within the boundaries of the new projects instead of flowing out into the broader society.

Moreover, the recent science and education initiatives may well end up like those that preceded them: well-intentioned experiments that miserably failed. Granted, today's experimenters are much more knowledgeable and worldly than their predecessors. But the central question remains: What will it take to propel the Arab world beyond the experiments and initiatives phase? Arab leaders need to spearhead massive programs aimed at awakening broad public interest in science, and to do so in a way that looks beyond the immediate utility of applied science research and education programs. Science needs to be pursued as a "culture" that can lead to progress in its various incarnations. It is science as a culture that, in the words of Reardon-Anderson, liberates people to follow their curiosity and achieve self-accomplishment. It is a culture that confers prestige upon and secures reasonable living standards for those pursuing scientific vocations. It is a culture that esteems science and prizes its permeation into daily life, rather than deeming it a fringe practice. And it is a culture that necessarily accommodates various and opposing views, since that is how scientific knowledge grows.

For that to be even remotely possible, the new initiatives should be allowed to sprawl outside the walls and gates of their artificial cities. The leaders of the Gulf have thus far shown a laudable commitment to their peoples. Now they need to give up control over these experiments so that they can extend their roots and flourish. The consequences will almost certainly be in their peoples' favor.