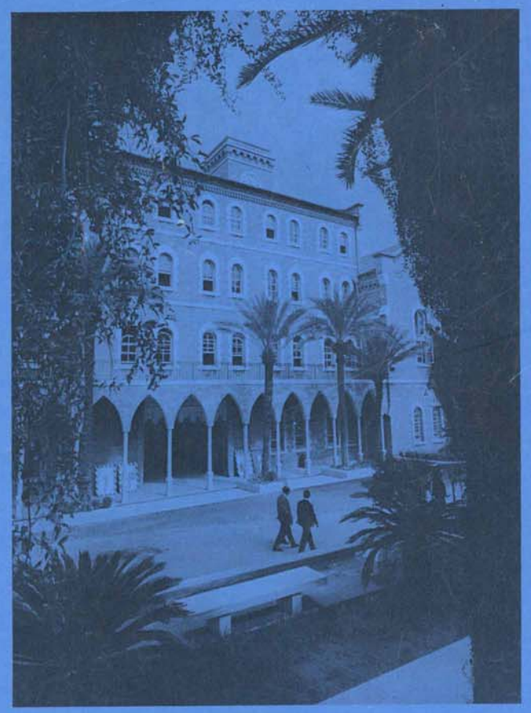

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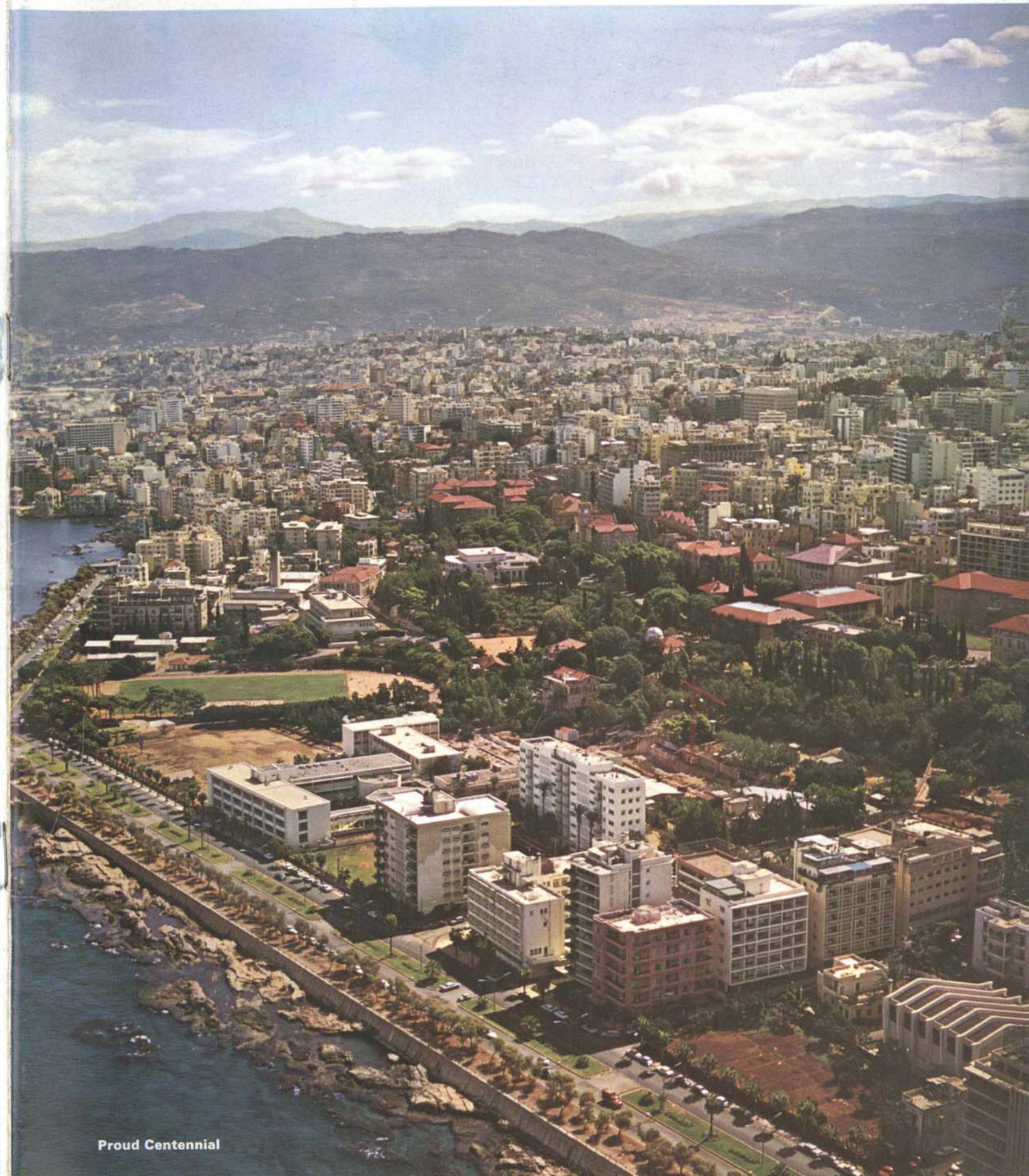
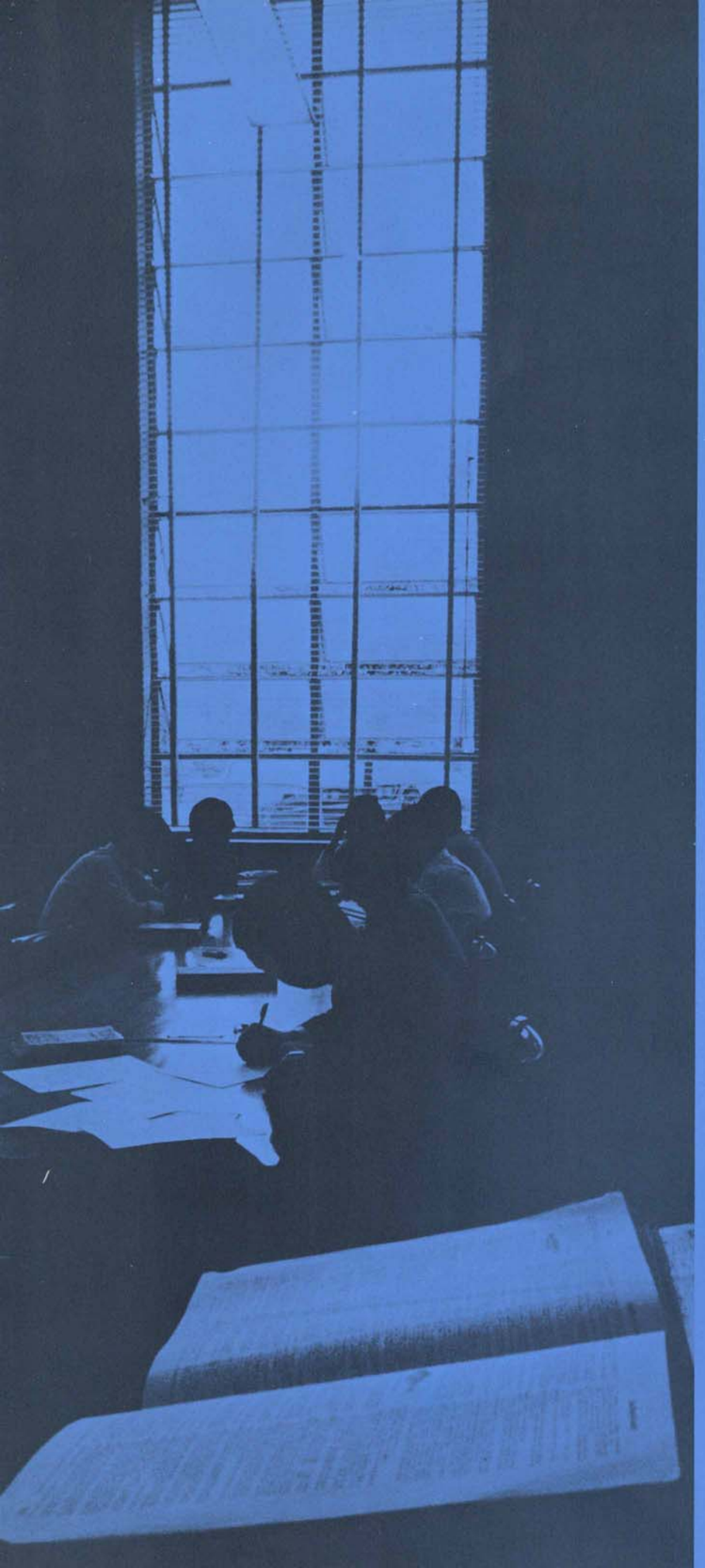


Proud Centennial



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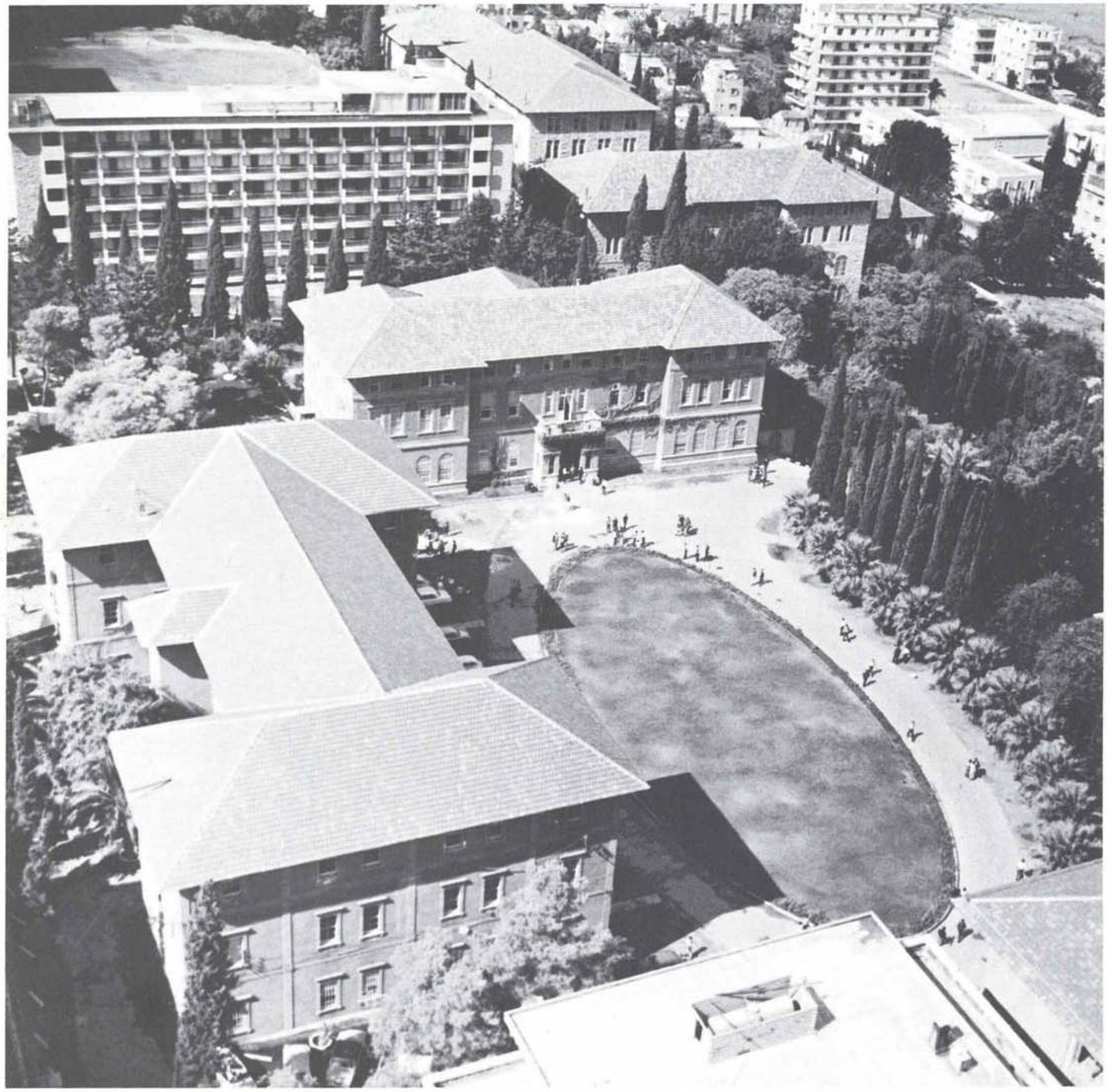
ARAMCO WORLD

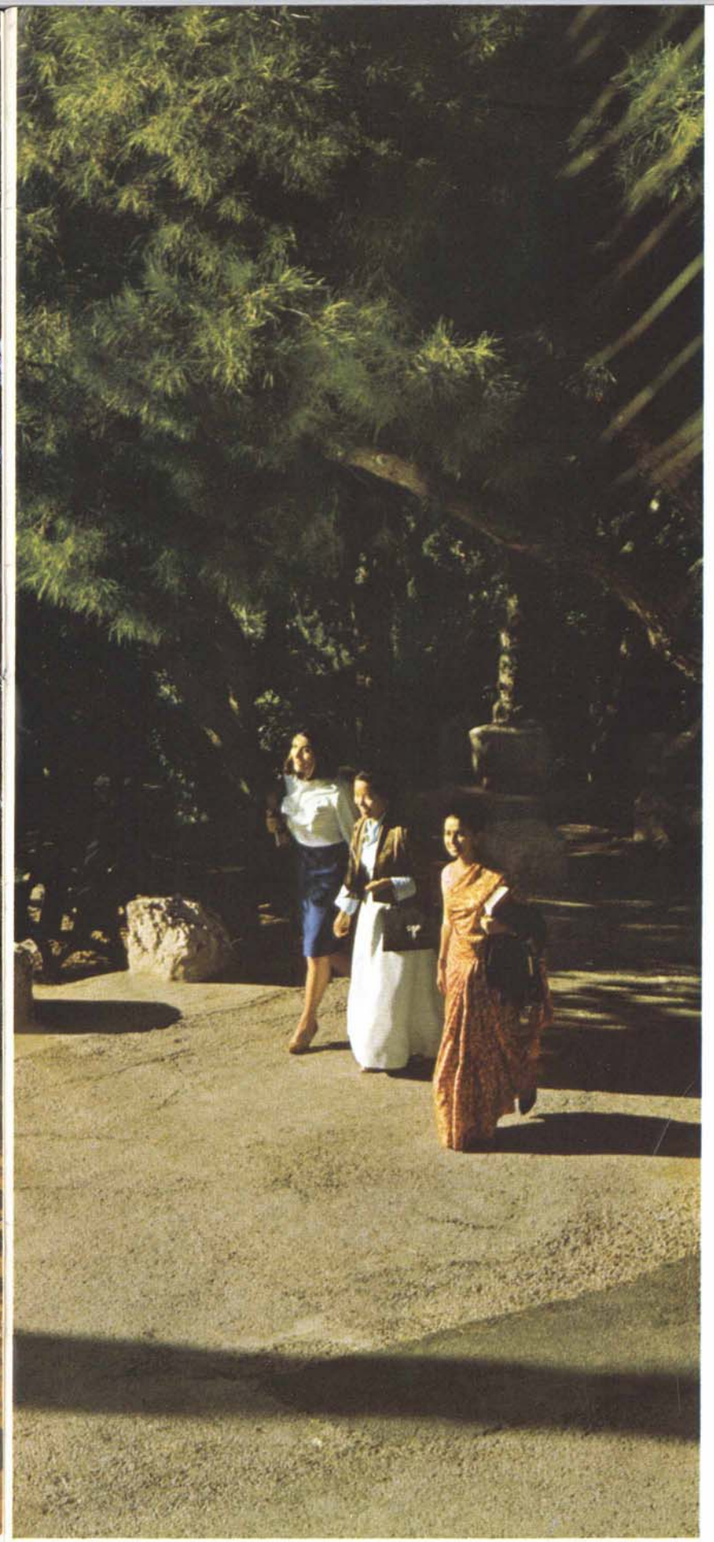
Cover: In the years that have passed since Daniel Bliss chose a lonely hill above the Mediterranean as the site of the American University of Beirut few persons have ever disagreed with his description of it as 'the finest site in all Beirut' and most, on seeing the breath-taking view of green grass, red-tile roofs and clusters of cypress trees—as captured here by photographer Tor Eigeland—would compare it with any campus in the world.



Lebanon's famous American University of Beirut celebrates its...

PHOTOGRAPHY BY TOR EIGELAND

College Hall (center, with tower), the oldest building on the A.U.B. campus, looks out over a vista of slim cypress trees, gravel paths, shaded walks and a broad green athletic field.



A.U.B. draws students from around the world. These girls are from South Africa, Nepal, and Lebanon.

PROUD CENTENNIAL

BY DANIEL DA CRUZ

Onto the campus of the American University of Beirut this June will come a vanguard of returning alumni: Arabs, Americans, Europeans, Africans, Asians; cabinet ministers and nurses; authors and doctors; businessmen and engineers. Some will be famous, some unknown. Some will be old, some young; some successful, some not. But whatever their origins, whatever their professions, ages or achievements, in returning to A.U.B. their intentions will be similar: to take part in the ceremonies and projects planned for the 1966-1967 centennial year; to acknowledge their appreciation of an institution that has, in the last 100 years, put an indelible imprint on the Middle East.

The campus of A.U.B. is most impressive, as, indeed, founder Daniel Bliss intended it to be. "We saw the site where the college now stands and fell in love with it at sight," he wrote later. "We had found the finest site in all Beirut if not in all Syria." Or, today's alumni might add, in the entire Middle East. A complex of stalwart sandstone buildings with red-tile roofs, it sprawls over 75 acres of lush hillside and slopes down toward the blue sea in a setting of quiet gardens, green lawns and gravel walks beneath rows of slim cypress trees. A more perfect place for learning and scholarship would be hard to envision.

It wasn't always like this. At the time Daniel Bliss purchased the site it was little more than a clearing in the cactus that flourished in red-sand hills above a deserted beach outside Beirut. But Daniel Bliss was a determined man and so the college grew—from an institution so small that its entire physical plant and student body were housed in one five-room house to a major university whose 70-odd buildings are straining the limits of the campus; from a curriculum of several purely basic subjects to a list of studies leading to 21 degrees in faculties of Arts and Sciences, Medical Sciences, Engineering and Agriculture; from a few shelves of reference materials to a memorial library housing 200,000 volumes. And it is still growing. A new $1.5 million chemistry building is on the drawing boards and scheduled for completion in 1968. Off-campus, the largest and most modern medical center in the Middle East has risen in a gaping excavation in the heart of modern Beirut. It will house not only a 450-bed hospital but the schools of Medicine, Public Health, Nursing and Pharmacy and will cost $24 million.

Nor has growth been restricted to physical structures. An initial enrollment of just 16 students has grown to 3,200 young men and women representing 61 nations and 22 religions. The faculty, just a handful of dedicated Americans in Dr. Bliss's day, now numbers 628, of whom nearly 400 are Arabs. The alumni have spread out through the entire Middle East to such an extent that today six out of the seven Arab ambassadors to the United Nations are A.U.B. graduates.

Changes of that magnitude are never accidents. At A.U.B. they came about as a result of the dedication, the drive, the faith of Daniel Bliss, a tough-minded, soft-hearted Vermonter who decided when very young to dedicate his life to the Arab world. To tell the story of A.U.B., in fact, is to tell the story of Daniel Bliss. And this, many years ago, is how the story began...

On the eve of the Battle of the Marne, French military legend has it that General Foch reported to Commander-in-Chief Joffre: "Hard pressed on my right. My center is yielding. Impossible to maneuver. Situation excellent. I am attacking."

Something of the same brave and reckless spirit must have seized Daniel Bliss when, on a spring day just one hundred years ago, he undertook to found a college in Lebanon, then a part of Syria. The Eastern Mediterranean had just exploded in the massacres of 1860 which claimed more than 11,000 dead and left Lebanon, a land in which literally every citizen belongs to a minority, trembling with hate and fear. But Daniel Bliss was not a man to be discouraged by adversity. He had rarely known anything else.

Born in 1823 in Vermont on a farm where labor was as scarce as work was plentiful, Daniel Bliss was set to fetching water, carrying wood and riding a plow horse almost as soon as he could walk. At 16 he began four years of back-breaking, brain-numbing drudgery as an apprentice in a tannery and then spent two years as a fruit-tree grafter before he was able to enroll in Ohio's Kingsville Academy. So apt a student was he that he was able to teach as he studied and in this way pay his expenses. In 1848 he entered Amherst, where he sold periodicals, weeded gardens and tended fruit trees to pay his way. He persevered, however, and got through not only Amherst College, but Andover Seminary as well where, in one climactic year, he was ordained, married and assigned to a mission in Syria.

Judging by the reaction of one apparently pessimistic colleague, the initial impression made by the young couple was somewhat less than sensational. "The Blisses have arrived," the colleague wrote. "Mrs. Bliss will not live a year and Mr. Bliss is not a practical man."

With probably no malice aforethought—for she was much loved for her consideration—Mrs. Bliss not only survived that year, but the next 55 as well. As for her husband, he amply demonstrated his practicality when, less than 10 years later, he succeeded in raising the then-remarkable sum of $100,000 in the United States to found in Beirut the first college of its kind in the far-flung Ottoman Empire.

To Daniel Bliss, higher education in Syria was long overdue. Although in 1860 there were already 33 American schools in the area, graduates, however promising, faced an educational dead end simply because no college existed closer than Constantinople. After the 1860 massacres, moreover, the Western powers had forced the Turks to guarantee the Lebanese Christian minority relief from taxes and forced military service, plus freedom of worship and a certain small degree of self-government. Since there was no trained local leadership to profit from this development, Dr. Bliss felt that this was the perfect opportunity to create one by means of a college combining the best of Eastern traditions and Western education.

With the cordial concurrence of the Mission Board, Daniel Bliss returned to his native land in 1862 where, in the words of his eldest son, he "..made 279 public addresses ... covered 16,993 miles ... (and) attended two commencements of his Alma Mater, which made him a Doctor of Divinity." Two years later, on May 14, 1864, New York's Governor Seymour signed a bill incorporating the new "Syrian Protestant College" under the laws of New York State, which to this day recognizes and endorses degrees from this institution. Then, rather than spend immediately the depreciated greenbacks he had accumulated with so much effort, Dr. Bliss headed for England to spend yet another 18 months raising 4,000 additional pounds, in the expectation, later proved correct, that peace and deflation would restore the dollar's buying power. Finally, after a three-and-a-half years' absence, Daniel Bliss returned to Beirut to open his school.

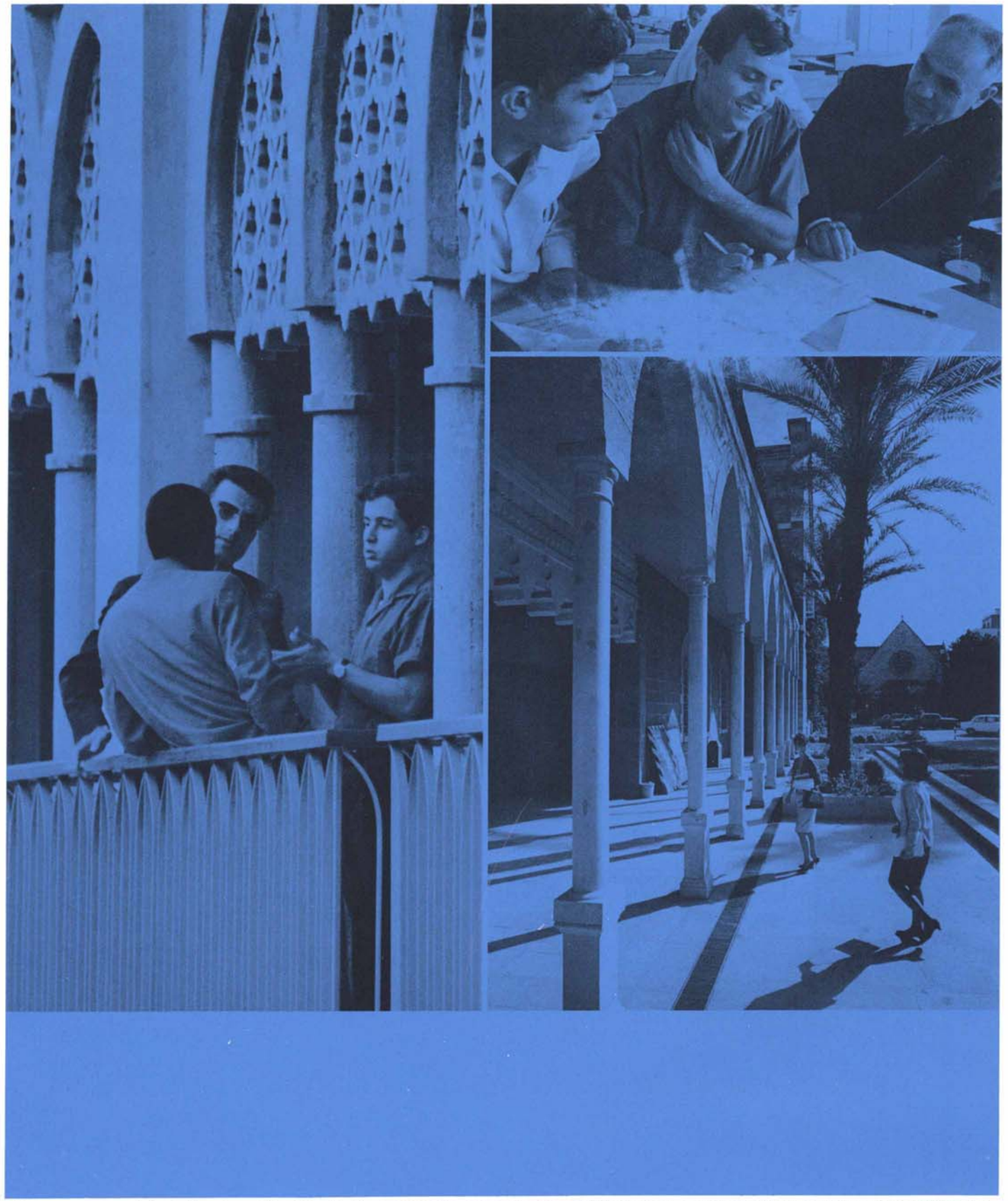
Experience had led him and his colleagues to regard with little favor the plan to educate young men outside the country. At that time individuals who had been educated in England or on the Continent exerted very little influence, on their return, in elevating their countrymen. On the contrary, their education tended to unfit them for usefulness by making them out of sympathy with their own people. "We propose that the pupils should be educated with reference to the business which they might propose to follow, as ... lawyers, physicians, engineers, secretaries, interpreters, merchants, clerks, etc., thus avoiding the reproach of sending forth helpless and useless drones upon society. In the interests of the independence and self-respect of the student body, the principle of self-support should be fostered as far as possible..."

The college opened December 3, 1866, and Mr. Bliss wrote an account of its early years:

> *"There were present 16 students, ... We were housed for two years in four or five rooms of an insignificant building, and for three years more in a house of larger dimensions, with two smaller buildings attached, in which we commenced a clinic and a hospital of three or four beds. We remained in a still larger building until 1863, when we removed to our present campus. During these seven years we scarcely had a name to live up to, although we were very much alive. A college on wheels does not impress the East with the idea of stability. We were not anxious to appear great, but we were anxious to lay foundations upon which greatness could be built."*

Despite its humble beginnings, there was nothing ordinary about the college. Merely assembling the student body was an annual logistic marvel. Students from Baghdad, for example, had the choice of shipping down the Tigris River, around the Arabian Peninsula, through the Suez Canal, and up the coast to Beirut, or of making the dangerous journey by camel across the bandit-infested Syrian Desert with a heavily-armed merchant caravan. Either way it was five weeks of strenuous travel.

The newborn institution was singularly blessed with a faculty whose members, through long residence in the Arab world, not only understood the working of the Eastern mind, but were uniquely qualified to open it to



Scenes on campus: students discussing politics before the Humanities Building; an engineering instructor chiding a student; girls hurrying to College Hall for conferences.

the best the West had to offer. The appallingly low level of medical practice in the Ottoman Empire had prompted the Board of Managers to organize a Department of Medicine from the very beginning and, as the students were mostly monolingual, the American physician-professors taught in classical Arabic. In the absence of texts they had to write their own for the four-year course, which were laboriously hand-copied by the students.

President Bliss, acutely conscious of the need to provide a campus where the college could function without periodic uprooting and removal to new quarters, spent many anxious months on horseback searching for the proper site. At last he found it and on January 22, 1870, made payment for it. Dr. Bliss was overjoyed at this initial success, but took another 29 years to complete the campus. A key piece of campus property, called "The Fig Orchard," was not acquired at the time because Mr. Bliss was determined not to pay an excessive price for it. After 29 years of good-natured haggling, legal maneuvering and stoutly-resisted pressure on the part of a succession of owners, who learned by hard experience that the educator from Vermont was nobody's easy mark, the college got the land. "In all our dealings," said Daniel Bliss, "we followed the command, 'Be ye wise as serpents and harmless as doves,'—harmless in not cheating others, wise in keeping others from cheating us."

Notwithstanding its natural beauty, the site of the college in Ras Beirut was remote from Beirut proper, connected to the city by a single mule path and surrounded by acres of cactus, robbers' nests and packs of jackals that howled in the night. The president lost no time in establishing on this raw, wild site a campus worthy of the reputation the college was already beginning to achieve as a serious institution of learning. With the help of his versatile faculty he himself designed the main building, College Hall, and superintended its construction from stone hewn on the spot.

> *"Years after, an English architect, on seeing the structures, asked the name of the architect. I mentioned the name of the one who drew the plans. 'But,' he said, 'who worked out the plans?' On my telling him that we did, and that we had made many mistakes but had managed to cover them up, he replied: 'That is perfection in art.'"*

One after another, in those first fruitful years, new structures were added from the college's slender endowment. Labor costs then being quite modest, the chapel was built for $30,000 and the observatory for $15,000. A preparatory school cost $37,430, First Hall $20,000, Post Hall $40,213. Daniel Bliss Hall, built in 1900, became the first edifice in the country to be made of reinforced concrete. And even though costing little, the structures were sound, as engineers discovered a decade ago when they decided to replace a supposedly "weak" section of roof in West Hall: in the end, to their intense embarrassment, they almost had to blast it off, so strong did it prove to be, and the expenses of this minor reconstruction amounted to several times more than the original cost of the building.

In the midst of bustling Beirut, red roofs in a setting of green trees mark a site that was no more than a cactus-covered hill of red sand when Daniel Bliss chanced upon it, decided to buy it and wrote exultantly: "We had found the finest site in all Beirut if not in all

Academic progress more than kept pace with the building program. From the original faculty of seven the school could boast a faculty of 15 in 1882, 53 in 1903. In 1882 there were but three departments: Preparatory, Collegiate and Medical; by 1903 they had added to these departments Commerce, Biblical Archeology and Philology, and a two-year course in pharmacy. The library outgrew its single room, which housed its original collection of 1,800 European and 500 Arabic books. By the turn of the century the library consisted of 13,800 European-language books, 1,000 in Arabic and Turkish, and 4,100 volumes in special collections.

The early history of the college was not one long, unbroken chain of successes, however. When only 16 years old, in fact, the institution was almost torn asunder by the storm that developed after a commencement address in 1882 by Prof. Edwin R. Lewis making favorable mention of the evolutionary theories of Charles Darwin—just 43 years before the Scopes Trial in Tennessee on precisely the same issue. His words so upset the Board of Managers that Dr. Lewis proffered his resignation. It was immediately accepted, whereupon most of the medical faculty resigned in protest and the students struck in sympathy. The controversy was eventually smoothed over and classes resumed, minus Dr. Lewis, but one lasting effect was a sudden shortage of professors competent to teach in Arabic. As a result, in the mid-1880's the switch was reluctantly made to English as the language of instruction. It was a change in any case inevitable due to the torrent of new literature—especially medical and scientific literature—published in that language which could not be translated into Arabic until long after it became obsolete.

One feature of the institution in the first few decades that didn't change, though, was the cost of a student's education: college tuition was still $25 a year—$50 in the schools of pharmacy or medicine—and board and room of a rather Spartan variety was available at $60 a year. The very reasonable cost of education, indeed, led to the occasional impression that it cost nothing at all, as when a Bulgarian boy turned up at the main gate in the 1920's with nothing more weighty in his pockets than a letter to the president from his father. It read: "Honored Sir: ... I present my son Benjamin to your university." As a later A.U.B. president, Dr. Stephen Penrose, remarked: "It was with some difficulty that the father was made to understand that the university could not accept such unbounded generosity."

Running the college was a relatively uncomplicated task in those days before professional administrators came on the scene. As president, Daniel Bliss was paid $1,500, and as his duties called for the teaching load of a full professor, he wasted little time on reports, committees and meetings. When the Board of the Managers met:

"All questions before us we quickly disposed of; Dr. van Dyck would make a motion and Dr. Wortabet would second it, and I would call for a vote which was always carried unanimously."

This seemingly off-hand method of administering a college would have been disastrous had not the president known every student, professor and staff member so well that rarely did any contingency surprise him. Dr. Bliss was equally knowledgeable in his management of the student body which, coming from a closely-regulated life where father and family were often inhibitions to initiative, found the relative freedom of campus life strange and disquieting. The president had no magic formula, unless it was to follow the principles he himself believed in.

"We were more ready to commend the good qualities of our students than to denounce their faults. I trusted the boys. Sometimes I treated one as if he was telling me the truth when I knew he was lying to me. I cannot explain the philosophy of it, but trusting a boy makes him trustworthy."

The president's eldest son, describing his father's unique methods of discipline recalled that "In later years, when no one was supposed to smoke anywhere on the campus, a student was enjoying a cigarette behind the Chapel. Presently he heard the firm step of the president

"From contemplation one may become wise," wrote A. Edward Newton, "but knowledge comes only from study." These two girls, hard at work in the university library, agree.

advancing. He hastily thrust his right hand, burning cigarette and all, into his side coat pocket. Instead of passing by with a salute, as usual, the President extended his hand. The student was obliged to extend his. 'How is your father in Damascus?' asked Dr. Bliss. 'And your mother and (still shaking the hand) your dear old grandmother? Give them my *salaams* when you write.' At this juncture the cigarette dropped from the burnt pocket to the ground. The president saluted and passed on with no further word."

Students treated to the blend of scholarship and humane consideration they received were bound to make the best of their natural capabilities. The first graduating class of five, in 1870, furnished by their subsequent careers an omen of the impact the college was to have on the Middle East. Two became officials in the Egyptian Government; two others became successful physicians, and the fifth man, Yacoub Sarrouf, founded in Cairo what was to become the Arab world's largest newspaper, *Al-Mukattam*.

The zeal of students in arousing the interest of the Arabs in their own illustrious heritage, submerged for so many centuries beneath the dead hand of Turkish rule, had an even more decisive effect on the history of the Middle East. In 1834 a mission press was brought to Beirut from Malta and with a newly-designed Arabic font began to publish works which stimulated a renaissance of Arab language and letters. The college likewise encouraged freedom of inquiry and, as the historian of the Arab National Movement, George Antonius, points out in *The Arab Awakening*, "When account is taken of its contribution to the diffusion of knowledge, of the impetus it gave to literature and science and of the achievements of its graduates, it may justly be said that its influence on the Arab revival, at any rate in its earlier stage, was greater than that of any other institution."

Such activity, however, came only after graduation, for political activity on the campus itself was severely proscribed. Had it not been, the college would have been a seething hotbed of strife through the years, for, from the very beginning, it has been host to a staggering number of religious sects and nationalities, each with its strong political affinities and antipathies. Though it had been founded as a frankly Protestant Christian institution, the college had wisely refrained from any attempt to convert students. Thus, while the first graduates were predominantly Christian, the very natural suspicion of Muslims and other sects gradually evaporated as the nonproselytizing nature of the college became known, and within a short time all the major religions of the world were represented. Indeed, in a part of the world where religious friction posed a constant problem, the college was an island of calm and tolerance. President Penrose has written that one year, "during the celebration of the Prophet's birthday by the Muslim Society, the Greek Orthodox students, then the dominant religious group on campus, played a surprise role. Quite unexpectedly, toward the close of the program, a Greek Orthodox leader mounted the rostrum and presented to the Muslim Society a beautifully ornamented copy of the Koran, together with a flag of green silk on which appeared, side by side, the Cross and Crescent. The impression made on the student body was profound."

If its reputation for tolerance took years to build, its academic prestige was established with its very first graduating class of medical students. Having successfully passed all their courses the nine young men took for granted that, in accordance with long-established Turkish tradition, the final oral and written examinations would be an ornate but meaningless ritual, after which they would be immediately admitted to practice. Imagine their consternation when three of the nine were found to be lacking in the qualities the college required of physicians and refused their degrees. This unheard-of blow at one of education's cherished but empty conventions at one stroke established the school as a courageous, reliable institution. Its graduates have added luster to that reputation by leading the medical profession in the Middle East down to the present day.

In time, the needs of the area forced the college to expand in new directions. A dental school, the first in the Ottoman Empire, was founded in 1910, typically on a shoestring: the capital set aside for equipment was $1,000, plus $1,500 to bring from the United States an eminent dentist to head the school. Before a student could qualify for admission to the Dental School he had to be a qualified physician. The graduate dentists were easily the best in the Middle East, so superior that their experience as a group proved that there is such a thing as being *too* good. They found that the time and expense to gain both M.D. and D.D.S. degrees were not rewarded proportionately in practice, in competition with mere tooth-pullers who provided services commensurate with their low fees. With considerable reluctance, the Board of Trustees closed the doors of the Dental School just before World War II, until the day when first-class dental care could become a self-supporting profession in the Middle East.

The fortunes of the School of Agriculture and the School of Nursing were more felicitous. A pioneer in both fields, the college faced formidable handicaps. Toward manual labor of any kind, save wielding the sword and the pen, the educated Middle Easterner has often been contemptuous. The story of the wealthy landowner who

visited his son at a Lebanese mission school and found him playing tennis exemplifies the prevailing attitude. Turning to the principal, he said, "Does my son have to do this work?" "No," the principal replied, "he likes to do it." "Very well, then," said the father, "but remember that he doesn't need to do it. I could perfectly well hire a servant to take care of it for him."

The School of Agriculture gradually displaced this attitude with one which finds that human dignity and sweat-producing labor are not, after all, mutually exclusive. Today every student of agriculture not only attends classes in the theory of agriculture but gets his hands dirty applying it on the big university-owned-and-operated farm in the Beka'a plain of central Lebanon. That they dig hard and deep has been beyond dispute ever since they uncovered the ancient lost city of Tel al-Ghasseel; that they master their calling is shown by the rapidity with which their less fortunate neighbors imitate their methods, once they are on their own.

With the School of Nursing, the college drove the first wedge into the twin Middle Eastern beliefs that the care of the sick was the work of servants and that women were neither to be seen nor heard. In a sense, the extreme social pressures against women entering this new profession were a tonic for the infant school, for it insured that only the mentally resilient and morally dedicated would apply for admission. The caliber of young women who made nursing an honored profession in the Middle East is implicit in an amusing recollection of President Bayard Dodge:

"One evening, the nurses were late in returning home as they had been seeing patients all day. A drunken refugee held them up on the road. They blew the horn of the Ford and flashed the lights but he refused to let them pass. Miss Hakim got out of the car and asked him to let them pass by, but he refused and pushed a revolver into her face. She hit him an uppercut which laid him flat. Then she arranged him neatly on the side of the road, folded his arms and put the revolver on his chest. Finally she returned to the car and drove her companions home to supper."

Some years later, women having proved themselves intellectually capable of absorbing a university education, the first women students were accepted in the School of Arts and Sciences. The same year—1924—the first woman to receive a degree was graduated from the School of Pharmacy and within the next decade female education became so respectable that even Muslim girls, including the daughters of a Prime Minister of Iraq and the former Sherif of Mecca, were attending the university. It was at the college, too, that Muslim women in Syria first appeared unveiled publicly, during a fund-raising drive to assist starving Muslim girls during World War I.

It was during this terrible international conflict, which engulfed the Middle East along with Europe, that Daniel Bliss died, at the age of 93. He had spent four years planning and raising funds for the college, then 36 years in its active direction, and finally 14 years as its patriarchal president-emeritus. His ramrod-straight figure mounted on horseback—he rode well into his ninetieth year—was familiar to generations of students, as were his kindly counsel and gentle inspiration. With a fortuitous inevitability, the post of president was filled by his son, Howard Sweetzer Bliss.

The younger Bliss was born in the Lebanese village of Suk-el-Gharb in 1860, and in a very real sense grew up with the college. Like his father, he graduated from Amherst, and then he studied a year each at the universities of Oxford, Göttingen and Berlin. As a native son of the Levant, he knew the strengths and weaknesses of his students, and unfailingly interviewed each prospective student personally. He inclined toward his father's humane, indirect methods of discipline: one afternoon he found two students at the point of entering his chicken yard, larceny in their hearts. He saluted them politely and to their great relief made no mention of their errand. Two days later they were invited to lunch with the president and Mrs. Bliss. The principal course was chicken.

The mettle of the man and his college was severely tested during the years of the Great War when, first as uneasy neutrals, then as active belligerents, Americans in the Turkish Empire were subjected to systematic harassment and persecution. For a time it seemed that the college must close. That it did not was in part due to the medical teams it sent out to help the sick and wounded at Constantinople and in Palestine. The doctors and nurses were received with such wonder and gratitude that the whole college won respect and help.

Nevertheless, the institution survived only with difficulty the privation that afflicted all of Syria, where disease and starvation claimed more than 300,000 lives by war's end. In the final months before liberation by British troops, the most common sound was the crying of hungry children, the sobbing of bereaved women, and the tolling of church bells for the dead. Many mountain houses became deserted, their occupants dead and their doors used to make coffins. Commencement of 1918 was held in May because supplies had given out and students could no longer be fed. The college suffered one final casualty when President Howard Bliss, due to his exertions during the war and as an adviser at the Versailles Peace Conference, where he spoke as a defender of Arab independence, died on May 2, 1920. The Blisses, father and son, had served their college for more than half a century.

After the First World War the need to change the name of the institution became apparent, for the Syrian Protestant College was now neither Syrian, nor Protestant, nor a College. Lebanon had become, under the peace treaty, an independent state under French mandate. The college, meanwhile, had far outgrown its original modest purpose, and encompassed faculties which in other countries were themselves distinguished by the name "college." As for the school's denomination, Dr. Bayard Dodge, successor to Howard Bliss, echoed the guiding principles of the founder when he said:

"To develop the spiritual natures of our students, we do not propose to proselytize, or to emphasize names and forms. To us Protestantism means religious freedom. It is for the mosque, synagogue, or church to provide the practical formalities of organized religion, but the school should join with them in fostering a consciousness of God, and a desire to live in accordance with God's moral purpose."

Accordingly, on November 8, 1920, the name was changed to the American University of Beirut, which more accurately described its true status. Its mission, while unchanged through the years, now however assumed new proportions, for the newly-independent Arab nations cried for the administrators, industrialists, professional men and teachers which the American University of Beirut was uniquely equipped to provide. Howard Bliss himself had foreseen this during the early days of the war, when he told the Turkish director of the still-born Saladin University at Jerusalem:

"We are not here as rivals; we are here to share with the people of the East the best things that we have in the West, or rather to exchange the best things that East and West have received. For the whole world needs the whole world. We wish, moreover, to promote and not retard the native educational enterprises in the Near East. In fact, it is our purpose to render ourselves, not indispensable, but, as soon as possible, *dis*pensable, and we shall go elsewhere just as soon as the ideals of education and of life cherished by us are adopted here."

That day was still far in the future. Meanwhile, the university answered the call to send to the far corners of the Middle East young men trained to deal with the problems of the modern world. The roll call of government administrators, businessmen, professional men, scholars and scientists who have streamed out from the main gate of the American University of Beirut thenceforth would read like a *Who's Who* of the Arab world. Since the Great War buildings and departments have been added, the student body and the faculty have inexorably swelled, and the emphasis in education has insensibly changed to meet the exigencies of the moment. And yet, try as they might, succeeding generations of teachers have been unable to improve upon the credo, embodied in the address of founder Daniel Bliss when he laid the cornerstone of College Hall nearly a century ago:

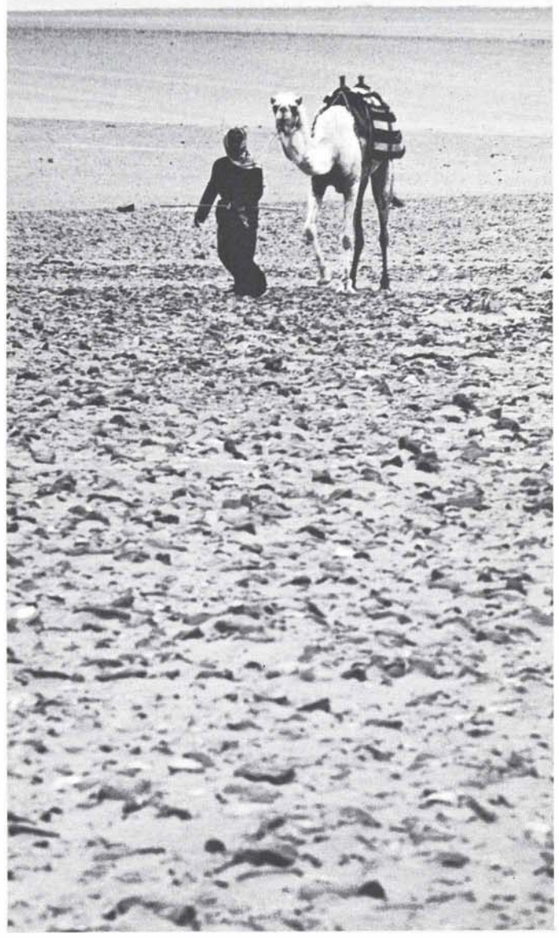
"This college is for all conditions and classes of men without regard to color, nationality, race or religion. A man, white, black or yellow; Christian, Jew, Mohammedan or heathen, may enter and enjoy all the advantages of this institution for three, four, or eight years; and go out believing in one God, in many gods, or in no God. But it will be impossible for anyone to continue with us long without knowing what we believe to be the truth and our reasons for that belief."

Daniel da Cruz, a free lance writer, is a former instructor of English at the American University of Beirut.

The university, which started with just 16 students, today enrolls 3,200, representing 61 nations.

THE POETS OF 'UKAZ

BY SAIF AD-DIN ASHOOR



PHOTOGRAPH BY V. K. ANTONY

At opposite poles are the worlds of commerce and poetry, the one ruled by realists, the other by dreamers. Yet there was a time when the two worlds were one, meeting and mingling in the fabled Arabian market town of 'Ukaz, and in the minds of the merchant-poets who foregathered there. The town is gone now, its disappearance perhaps symbolic of the impossibility of these two types of human endeavor—each so essential to man's well-being—to coexist at such close quarters. But before it went it left a deep mark in the history of Arab letters; indeed, to some the history of Arab letters *begins* at 'Ukaz.

The pressure of centuries has laminated fact and legend about 'Ukaz into a thin layer of tradition, pressed like a dry leaf between the pages of memory. Situated on a plain among the high arid hills halfway from Taif to Mecca, 'Ukaz was the last of the market towns before the holy site of the Black Stone, the goal of pilgrims from all Arabia. Mecca was a spiritual journey's end and at 'Ukaz, therefore, they had one last opportunity to indulge in the worldly pleasures of good conversation, the display of fine camels and hard bargaining. Its informal trade in time evolved into an annual fair preceding the pilgrimage season, and no man who wanted to know what his distant allies and enemies had been doing during the previous year—as who did not?—could afford to miss the fair. For there, in the perfect safety of the four months of "holy truce," men laid aside their weapons, listened to petitions, redeemed prisoners, heard poems in their praise (in return for silver and golden rewards in exact proportion to the ingenuity of the poet), and resolved feuds which in another place, another time, would have left brave men dead upon the ground.

Heralds of powerful men would go through the dusty streets, proclaiming their readiness to help their fellow pilgrims. "Whosoever be in need of food—I will feed him," one could cry. "Whosoever be afraid—I shall protect him," shouted another, and a third, "Whosoever be without means to go to Mecca—my camels will bear him." The luxuries of desert life were few, and the shaikhs could think of no better expenditure of their money and effort than the acquisition of a reputation for generosity among their fellow-men. Then, even as in recent times, men worked hard and took enormous risks to become rich, only to pauperize themselves in magnificent entertainments and banquets open to all who could fight their way to the board. At 'Ukaz during the season of the "holy truce," many a reputation was created for open-handedness which outlived by generations the benefactor himself.

But there was yet another way to become celebrated, available to the most humble man, guaranteeing a fame at once painless and permanent. This was the creation of a poem of such vigor, beauty and irrepressible rhythm that the hearers would absorb it as it stood, wear it like a rich robe, carry it to the far horizons of Arabia, and pass it down from father to son as part of their own legacy. Prose invention, primarily in the form of stories instructive or martial, underwent a constant metamorphosis, improving with each telling or dying in the process. Poetry was immutable. Either it survived in its original form or it died stillborn. Its rhythms and its rhymes made possible committing it to memory—an important consideration, since writing generally was still centuries in the future. And the incentive to remember was there, for poetry was the transportable substitute for painting, architecture, sculpture, music, history, moral instruction and the daily newspaper—all wrapped into one.

Tradition says that the first Arabic poetry was nudged into being by the rhythmic tread of the camel's uneven gait, imitated in words by a rider either bored, inspired, or perhaps only interested in keeping his companions awake and amused. If so, the tradition would explain the synonymity of *shadi* (singer) and *saa'iq* (cameleer). From a structural standpoint, however, it is probably that rhymed prose used by sages and traveling poets was the prototype of Arabian poetry. The *budas'* of the camel driver was quite possibly the next development, as custom maintains, derivative of the camel's tread. *Rajaz*, the metrical interval of greatest antiquity, with four or six feet to the line, developed from rhymed prose. "It was the first-born child of poetry," according to Arab definition, "with rhymed prose for a father and song for a mother."

These poetic forms found ample expression in recording the dynastic struggles that beset the Arabian Peninsula in pre-Islamic days. Often they are our only source of information about the events of the time, and many of them were first voiced in 'Ukaz. Lending itself especially to that era of the individualist was the *qasiidah* (ode) which memorialized the deeds of desert heroes. "Appearing with Homeric suddenness," historian Philip K. Hitti writes, "the *qasiidah* surpasses even the *Iliad* and the *Odyssey* in metrical complexity and elaborateness. Rich in animated passion, expressed in forceful and compact language," the *qasiidah* dominated the recitations at 'Ukaz. But poetry had softer and less martial uses too, as is illustrated by the well-remembered story of the poet al-A'sha.

Once al-A'sha, on his travels, was entertained by one al-Muhalliq who had many lovely but—alas!—single daughters, to whom he hoped al-A'sha's compliments would attract hosts of suitors. The father slaughtered his only camel for a feast, displayed his beautiful daughters in their finery, and hopefully awaited the compliments which never came. Al-Muhalliq was deeply disappointed when his guest left, uttering not a single syllable in their praise.

A few months later, however, al-A'sha appeared at 'Ukaz to take part in a great poetry competition, and for his offering he recited a long ode to—not the beauty of his daughters—but the generosity of al-Muhalliq himself, concluding with these lines:

I cannot sleep, but not because of heartbreak or sickness;
That beacon-light so distant keeps calling me, just
As all humankind, lured by its tender warmth, must
Toward it turn, where in the soft night's stillness
The princely form of al-Muhalliq by his fire for all to see
Awaits us impatiently, attended by his son Hospitality.

Since tradition had it that especially hospitable Arabs would light a bonfire to guide strangers to their tents, that they might partake of the host's liberality, the moral of the poem was not lost on al-A'sha's listeners. Visitors were soon flocking to al-Muhalliq's fireside, and to his immense relief he soon became the father-in-law of many rich and powerful men.

Not only in the development of poetry, but in the evolution of the Arabic language itself, 'Ukaz played a significant role. Limited by custom to nonviolent argument, the merchant-poets engaged in friendly controversy over the relative merits of the many regional dialects they spoke. The result was an informal, Arabic version of the Académie Française, in which many of the individual dialectical distinctions disappeared by common consent, replaced by terminology everybody could agree on. The fair at 'Ukaz thus gave a powerful impetus to the unification of the Arabic language, a process carried to its logical fulfillment by Muhammad in the revelation of the Koran.

It is still remembered with affection by everyone who recalls that the ancient attributes of the perfect Arab were articulation together with proficiency in archery and horsemanship, and that "the beauty of man lies in the eloquence of his tongue."

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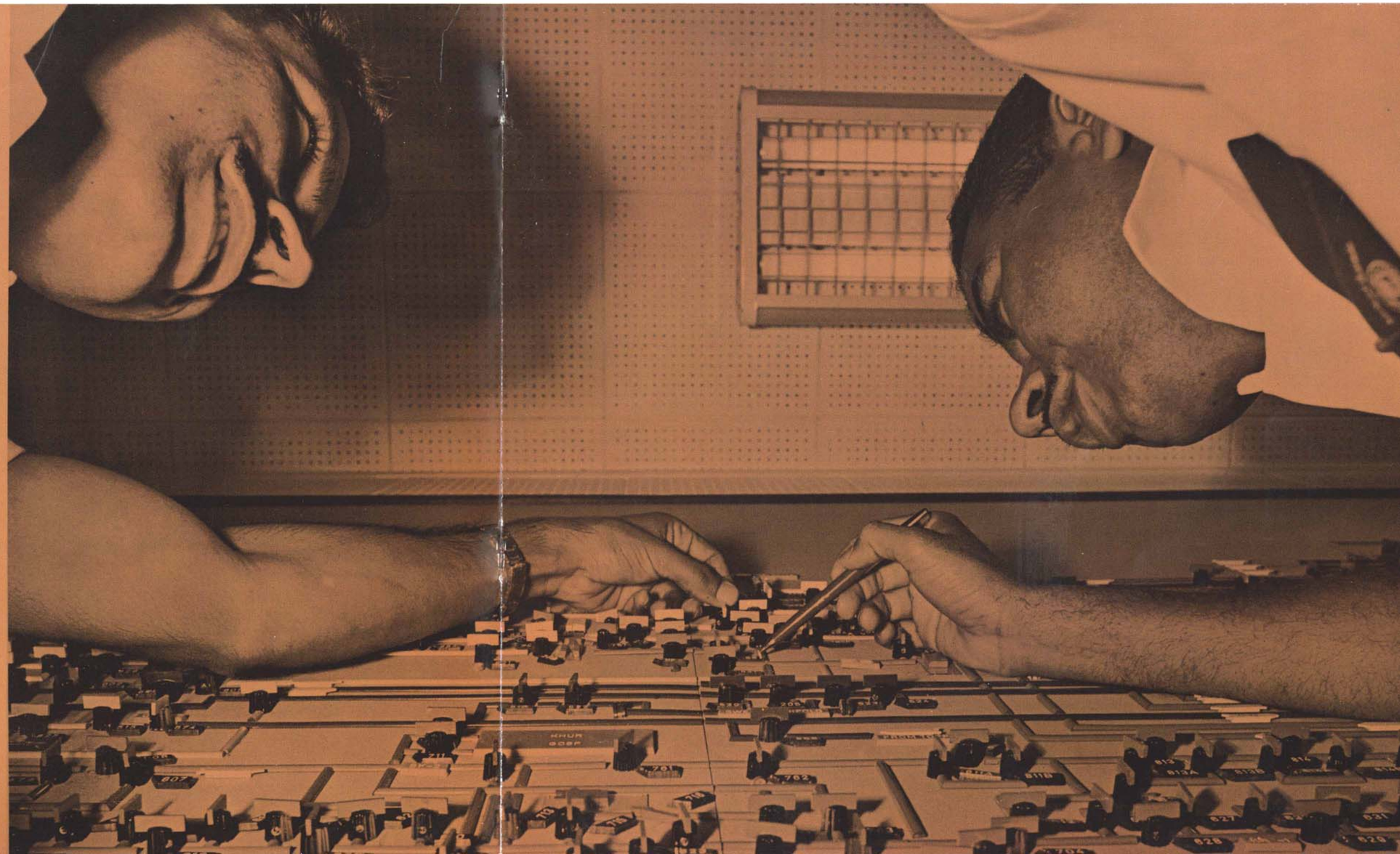
IN THE NERVE CENTER OF ARAMCO'S DISTRIBUTION OPERATIONS, SKILLED DISPATCHERS REGULATE THE FLOW OF 85 MILLION GALLONS OF OIL EVERY DAY.

AT THE TURN OF A TAP

BY JOHN BALLANTINE

PHOTOGRAPHY BY BURNETT H. MOODY



A chain of circumstance is the only tie that binds together Paul Mayer and Ali Hamed. The one is a bank teller in Hamburg, Germany, father of three, owner of a little brick row house with a vegetable garden in the back; the other is an oil dispatcher in Abqaiq, Saudi Arabia. Though they have never met and never will, they are at opposite ends of a sequence of events set in motion by the considered opinion at the weather station in Hamburg that this March will be slightly cooler than it was last year.

This information, which might provoke a mild yawn from Herr Mayer, elicits quite a different reaction from the petroleum marketing organization in Hamburg which supplies him, among thousands of others, with fuel oil. A quick slide-rule calculation assures the supplier that as a result of the predicted two-degree drop in mean temperature, he will require six per cent more fuel oil than he did the previous March, and immediately he increases his standing order with the nearest refinery. The refiner, who has enough oil on hand to fill the order with ease is, however, a cautious man who prefers to keep his reserves at a safe level. So into the international petroleum market he goes, to find a company which can supply him with additional crude on reasonable terms.

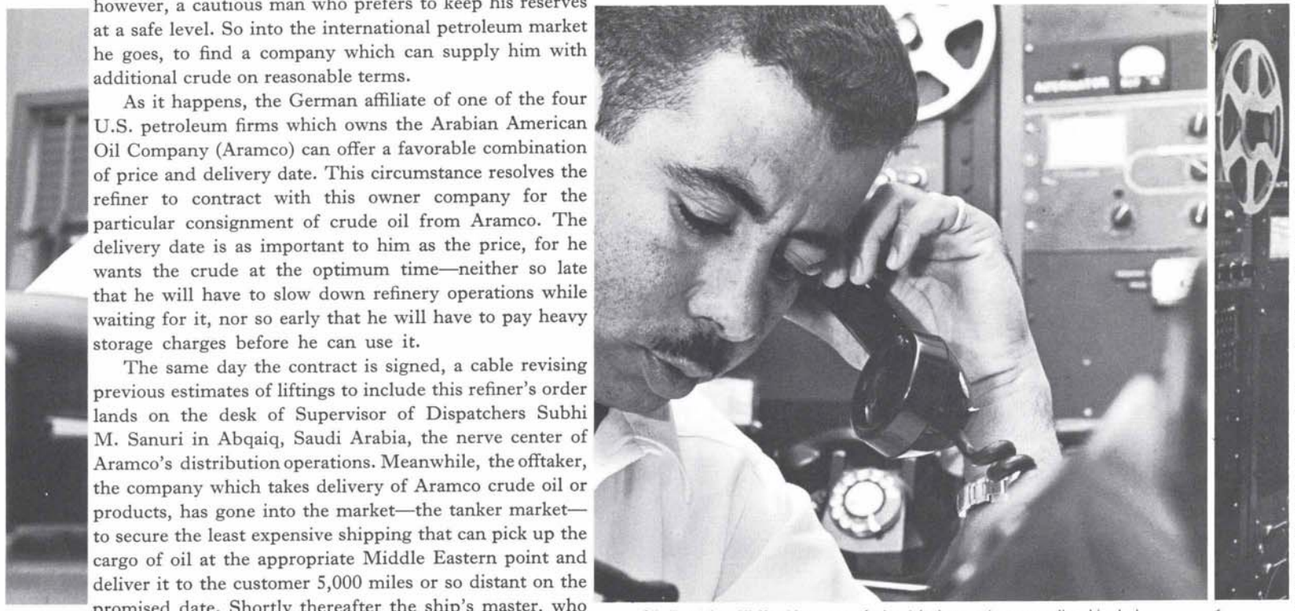
As it happens, the German affiliate of one of the four U.S. petroleum firms which owns the Arabian American Oil Company (Aramco) can offer a favorable combination of price and delivery date. This circumstance resolves the refiner to contract with this owner company for the particular consignment of crude oil from Aramco. The delivery date is as important to him as the price, for he wants the crude at the optimum time—neither so late that he will have to slow down refinery operations while waiting for it, nor so early that he will have to pay heavy storage charges before he can use it.

The same day the contract is signed, a cable revising previous estimates of liftings to include this refiner's order lands on the desk of Supervisor of Dispatchers Subhi M. Sanuri in Abqaiq, Saudi Arabia, the nerve center of Aramco's distribution operations. Meanwhile, the offtaker, the company which takes delivery of Aramco crude oil or products, has gone into the market—the tanker market—to secure the least expensive shipping that can pick up the cargo of oil at the appropriate Middle Eastern point and deliver it to the customer 5,000 miles or so distant on the promised date. Shortly thereafter the ship's master, who may be anywhere on the high seas at that moment, receives a radio message from his home office to proceed to the Saudi Arabian terminal of Ras Tanura, notify Aramco of his estimated time of arrival, load the cargo of crude and depart for northern Europe.

In Abqaiq, well in advance of the ship's estimated time of arrival at Ras Tanura, Supervisor Sanuri has instructed Dispatcher Ali Hamed to order a slight increase in deliveries from wells of Ghawar field to accommodate the incoming ship, which, with such forward planning, will find the crude ready for loading the moment it docks at Ras Tanura. The return journey of the tanker will take the oil by stages to an oil terminal at Cuxhaven on the North Sea, thence to a refinery at Hamburg, the tank truck, and in due course to the home of the unsuspecting, entirely fictitious Paul Mayer, who will not have to return from his banking job to a cold house.

Ali Hamed, on the other hand, is very real, and the fuel-oil saga is in essence typical of what happens whenever a West German citizen, for example, takes an interest in keeping himself and his family warm indoors. With a minimum time spread of a month between order and delivery of overseas crude, a maximum of foresight is required by domestic suppliers in anticipating demands, as is a well-honed efficiency on the part of the oil dispatchers to see that it is filled. Ali Hamed and his seven fellow dispatchers at Abqaiq are the men who supply the delicate touch to the tap that pours forth over 85 million gallons of oil a day.

Watching the dispatcher at work in the control room at Abqaiq, it is impossible to avoid the invidious comparison of his situation with that of the spider in the center of his web. Seated at his desk rimmed by nine telephone sets (four radio circuits, five land lines), hemmed in on the right by an electric calculating machine and on the left by a bank of radio transmitters and receivers connecting him in an emergency with seven separate radio networks, the dispatcher responds to the slightest stimulus from his many invisible filaments, and must react instantly and with mathematical precision. For the movement of petroleum within the network of pipelines that stretches 1,187 miles in all directions from Abqaiq, transporting a substance that is highly volatile, malodorous, explosive, mercurial and precious, the dispatcher has complete responsibility.



Oil dispatcher Ali Hamid on one of nine telephone sets surrounding his desk.

To reach this post of trust may take years. Dispatcher-trainees are handpicked from among bright young Aramco employes and put through a rugged program which includes classroom instruction in English, geography, mathematics and allied subjects. There is no "graduation"; a student remains a student until the supervisor of dispatchers is satisfied beyond all doubt that the trainee knows his subject matter backward and forward. The same is true of the ensuing on-the-job training at the various facilities whose activities he will ultimately regulate —the gas-oil separator plants, stabilizers, pump stations, power plants, and so on—where thorough study of the operation, emergency measures and the men who apply them substitutes for a hard-and-fast program.

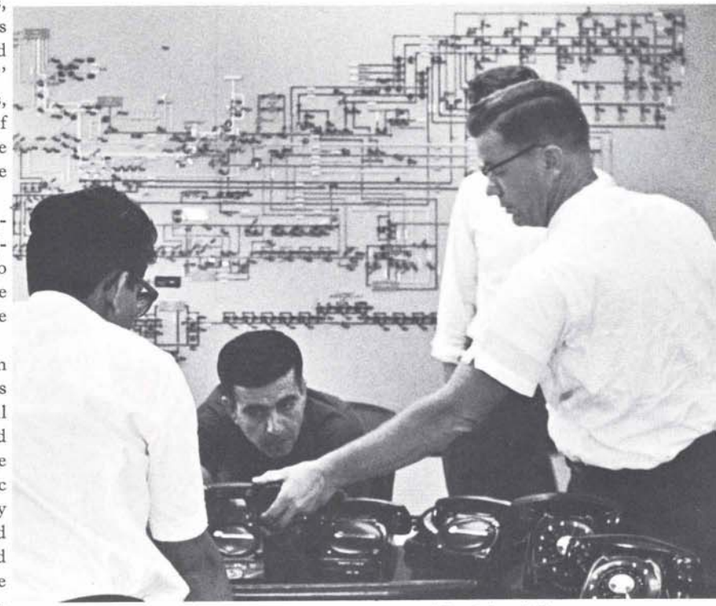
"After all," observes Supervisor Sanuri, "though the dispatcher has all manner of information on hand to help him—operations manuals, facility limitation statistics, past performance data—in the end 85 per cent of his decisions must be made on the spot under pressure, and must be right the first time; there may not be a second." Conceivably, the trainee's tutelage could last 10 years, but in practice most dispatchers master the details of their work within four years, which is followed by from one to four years at the side of a seasoned dispatcher before they're on their own.

Although its application is a matter of infinite complexity, an art of making a great many small, well-timed decisions, the theory of oil dispatching is fairly simple. To visualize the factors involved it is first necessary to trace the flow of oil from its beginnings at the wellhead to the point where Aramco's customers take charge of it.

The crude oil of eastern Saudi Arabia emerges from about 300 producing wells in 10 different fields and flows under wellhead pressure directly to the nearest gas-oil separator plant. In its natural state crude oil is a liquid containing varying amounts of hydrogen sulfide (the substance which gives rotten eggs their characteristic aroma), natural gas and other impurities. At the highly automated gas-oil separator plants (in the trade, called GOSPs as one word) high-pressure gas is removed and piped out to gas injection facilities, which return it to the underground oil reservoirs to maintain wellhead pressures, thus postponing the day when it will be necessary to pump the wells. Low-pressure gases are separated simultaneously and converted to propane or butane at a liquefied petroleum gas plant, for enriching crude or for direct sale to exporters.

Pumped to the stabilizers, a collection of cylindrical towers and a maze of steel piping, part of the crude's remaining gas is boiled off in reducing the hydrogen sulfide content by about 95 per cent. The stabilized sweetened crude, now safer to handle because its poisonous and corrosive H_2S has been removed, is shunted to tank farms consisting of huge steel storage tanks of 180,000 to 325,000 barrels capacity each, to await final transfer to one of four destinations: the 255,000 barrel-per-day Ras Tanura Refinery; the Ras Tanura Marine Terminal for loading aboard tankers; the pump station in Dhahran which pushes crude oil through twin underwater pipelines to a refinery on the island of Bahrain, 20 miles to the east; and the tank farm at Qaisumah, last stop before a desert journey across northern Saudi Arabia via facilities of the Trans-Arabian Pipe Line Company to its terminal at the ancient Lebanese city of Sidon, on the Mediterranean Sea.

The dispatcher's role in this fairly straightforward process is to keep the oil moving steadily from well to GOSP to pump station to stabilizer to tank farm. In theory all he has to do is to order the valves turned on at the wells until the tank farms are filled, then shut the wells down until the tank farms are empty, before the time comes to repeat the cycle. He could actually do this, except that a sudden descent of empty tankers at Ras Tanura could not be supplied from a near-empty tank farm (nor wait until storage tanks were filled), and, more important, the off-again, on-again operation of such huge facilities is prohibitively expensive. The dispatcher's ideal, indeed, is to keep *all* his units operating with the minimum possible change, just as the economy-minded driver tries to maintain a moderate but constant speed in traffic, instead of jack-rabbiting from one light to the next.



A problem, a meeting, a decision. Subhi Sanuri, center, and Frank App, right.

"Still, with all the equipment operating at peak efficiency," says H. J. Van Hatten, a Nebraska-born mechanical engineer and Aramco pipeline staff man,

In his Abqaiq command post Ali Hamid at all times knows exactly where the oil is going, how much and when.

"dispatching would be a breeze. The bind comes because equipment, being susceptible to wear, corrosion and mechanical failure, must be periodically inspected and repaired, or else risk an accidental and unscheduled stoppage that could put the whole system out of kilter for months. But removing a piece of vital machinery such as a power plant for the days or even weeks it sometimes takes to service it imposes that much extra strain on the other parts of the system to maintain a smooth flow of crude, much as if you were working on one cylinder of an automobile engine while the other five were pulling the car uphill. It also puts a strain on the dispatcher to re-route the crude with as few changes in pressures and rates of flow as possible, and thus avoid ship tie-ups, fluctuations in labor requirements and general administrative headaches."

During a lull on the "slow" afternoon shift, from three o'clock to eleven, Ali Hamed leaned back in his chair, lit a cigarette and pointed to the huge wall flow diagram directly opposite his desk, showing hundreds of valves and eight grades of petroleum and petroleum products represented by thin lines of different colors.

"That," Ali said, "traces the hundreds of miles of pipeline and dozens of facilities controlled from this desk. Every change in pressure or flow rate anywhere must be authorized from here, because what happens at one station affects them all, and only the dispatcher can see everything. He's the only person who has the necessary information to make compensatory adjustments all the way down the line. A lot of work here is routine, meticulous recording of two-hour reports from all the units—GOSP oil temperature, discharge pressure and flow rate, output of sweetened crude from stabilizers and its gravity and H_2S content, weather reports from pipeline stations, and sometimes..."

He leaned forward to answer a radio call that suddenly boomed in.

"Abqaiq One reading," the receiver said above the static.

"Go ahead," Ali answered. He picked up a pencil to jot down the information as it came in.

"Twenty-eight, one zero two, one zero four nine; transfer line; one zero two, three zero four, one nine six two; QA dash two, two five zero..."

As the voice droned on, "Van" van Hatten said:

"This business of 'compensatory adjustments' may be a bit hard to follow the first time 'round. But a few days ago we had a comparatively simple, everyday situation that illustrates what Ali was talking about.

"We wanted to reduce the shipping rate out of Abu Hadriya field to 60 MBCD—that's thousand barrels per calendar day, in order to T and I—*that* means test and inspect—the Fadhili Gas-Oil Separator Plant which supplies it. Strictly routine. First we reduced the flow out of Abu Hadriya, as scheduled, and shortly afterward shut down the Fadhili GOSP and the wells that flow into it. So far so good.

"However, this field's production goes to the Trans-Arabian pipeline, so in cutting back its flow to 60 MBCD, we were reducing Tapline's intake. To compensate for this loss we increased the flow to QA-3 ("QA" merely denotes one of the pipelines out of Abqaiq leading to Qatif Junction) line, which supplies Tapline. That took care of Tapline's requirements.

Van took a deep breath.

"However,—again—QA-3 also supplements the flow of QA-1 line, which goes to the tank farm at the Ras Tanura Terminal. Now, even when it is operating at full capacity, QA-1 can't supply all that Ras Tanura needs, because up to 10 ships berth every day at its docks. What to do?

"Well, since we knew of the forthcoming T and I a week in advance, we increased the flow out of QA-3 into QA-1 for the 48 hours *previous* to shutting down the Abu Hadriya GOSP, with the excess-of-normal flow building up a reserve in the Ras Tanura tank farm, to the same degree we had to cut it back once we began to divert part of QA-3's flow from QA-1. See? Had there been any breakdowns, of course, we'd have been in trouble. As it was, it took about 50 hours of switching crude back and forth from on line to another, but the steady flow was never interrupted, and we didn't have to push any of our facilities to the danger point."

He paused to see if all this had sunk in. Apparently reassured, he went on:

"But that, as I say, is a simple situation. A really *interesting* case, though, came up last..."

At this moment a Teletype machine in the corner began to clatter, and Van lost his audience.

Teletype transmission supplements the dispatcher's radio and telephone circuits for communication within Aramco's pipeline area. In the town where Aramco has its headquarters, Dhahran, a communications center receives messages by radio from Aramco's New York office, ships at sea, and Sidon and Beirut in Lebanon, relaying them by Teletype to Ras Tanura, with information copies to Abqaiq. Many of the cables received are so technical that for the layman they may as well be written in Sanskrit. Others are comparatively comprehensible, as this from a British tanker:

OUR ETA 0030 GMT SIXTH LAST PORTS HONGKONG 19TH FEBRUARY BAHRAIN 17th JANUARY NO DEATHS NO SICKNESS CREW 12 EUROPEAN 33 CHINESE ALL SMALLPOX AND CHOLERA CERTIFICATES VALID REQUEST PRATIQUE /S/ MASTER

About 10 times a month Aramco's offices in New York send cables to Dhahran similar to the following:

S6759 GOPIPEMANSPRO JULY AL FOLLOWING R452O 3577 3732 2313 1O62 MBD AM FOLLOWING R452O 436 636 341 119MBD AM FOLLOWING R452O 1193 3242 3276 482MBD AH SCHEDULE INCLUDES TBNS TOTALING 9OO MB

WEBSTER

The cable tells the addressees, the General Office Plants and Pipelines Department, Manufacturing Department, the South Pier and the Refiner's Office, that the after the ship referred to by number (R452O) has been loaded, so many thousand barrels of Arabian Light grade crude oil will be required up to the end of the month, so many thousand barrels of Arabian Medium grade and so many of Arabian Heavy. This enables those at Aramco responsible for filling customers' orders to keep up to date on future requirements of Aramco crude oil and products, and is the kind of information that is of vital interest to the oil dispatchers of Abqaiq.

Ali Hamed leaves his desk to sweep his eyes across the twitching Teletype paper, sees nothing urgent, and returns to his desk to finish converting, computing and entering the last of the bihourly readings on his 20- by 56-inch log sheet, now nearly a solid mass of numbers.

"This work is continuous, demanding, and sometimes pretty nerve-racking," he says finally, looking up. "You have to answer automatically in the language which the

Subhi M. Sanuri, supervisor of oil dispatchers in Abqaiq, posts total sales through the various outlets (listed at top left hand corner of the blackboard) through which Aramco sends crude oil.

By Teletype and radio telegraph, dispatchers link pump stations, ships, headquarters and the terminal.

caller uses—either Arabic or English—and needless to say, you don't want to choose the wrong words. It's been known to happen that half of these phones start ringing at once. Then you can only answer them one at a time, find out if it's an emergency and, if not, tell the man to stand by until you answer the others."

And what if there *is* an emergency?

Ali Hamed was thoughtful.

"Then hope that it's a small line break and not a fire. A line break is bad, of course. Sometimes a passing motorist will detect a leak in a pipeline and phone in. Or the dispatcher himself will spot a discrepancy from the two-hour readings—notice that there is more being pumped out of one station than is being received at the next. In either case, he sends someone out to check. If the leak is confirmed, he doesn't hesitate, but informs top company officials, orders the upstream pump station to shut down or divert its stream to another line, alerts the repair and maintenance crew, and then becomes the communications link among all concerned. A minor break in the line can usually be repaired in from 10 to 12 hours; a big one takes 16 to 20.

"Fire, of course, is the number one disaster that can strike any oil installation. When fire broke out in the 'Ain Dar GOSP Number One in the spring of 1964, it took only five hours to extinguish and just 72 hours to bring the GOSP back on the line, but the fire caused a $200,000 loss.

"The dispatcher has about five things to do when a fire is spotted, and he usually tries to do all of them first. If it's nighttime he hits that button next to the radio panel and a bell automatically starts ringing in the homes of the fire chief and company executives. He dials 3100 on the emergency phone, which gives him a simultaneous link with the fire chief, supervisor and hospital, so they can get the details at once. He immediately starts to divert the flow of oil around the fire, notifies all stations to be ready for sudden pressure surges as he shuts down sections of the line in the fire zone. He flips on a tape recorder which, from that moment on, will record every word flowing in and out of the dispatcher's office—and there will be plenty of them, too—and hooks up telephone sets to the radio circuits which blanket every activity concerned with the fire. In less than five minutes the man in charge of each department, the pipeline superintendent, chief engineer, communications supervisor, maintenance superintendent, safety engineer, chief dispatcher, plus the district manager of Abqaiq and his secretary, are gathered here coordinating by radio the work of their men with the fire-fighters. And they won't go home until the fire is out, if they stay here a week. Everybody here knows his job, so no one at the scene of the fire has to wait more than seconds for a decision."

All in all, the dispatcher's job sounds like a 24-hour-a-day proposition.

"Every day. More often it's 25 hours. Sometimes maybe 27."

How's that?

"On top of the dispatcher's regular work, he always has to be thinking about what could go wrong, where potential trouble might pop up suddenly, what could break down in the middle of the night, and then plan for the worst. It's like a chess game in which you always have to think two moves ahead."

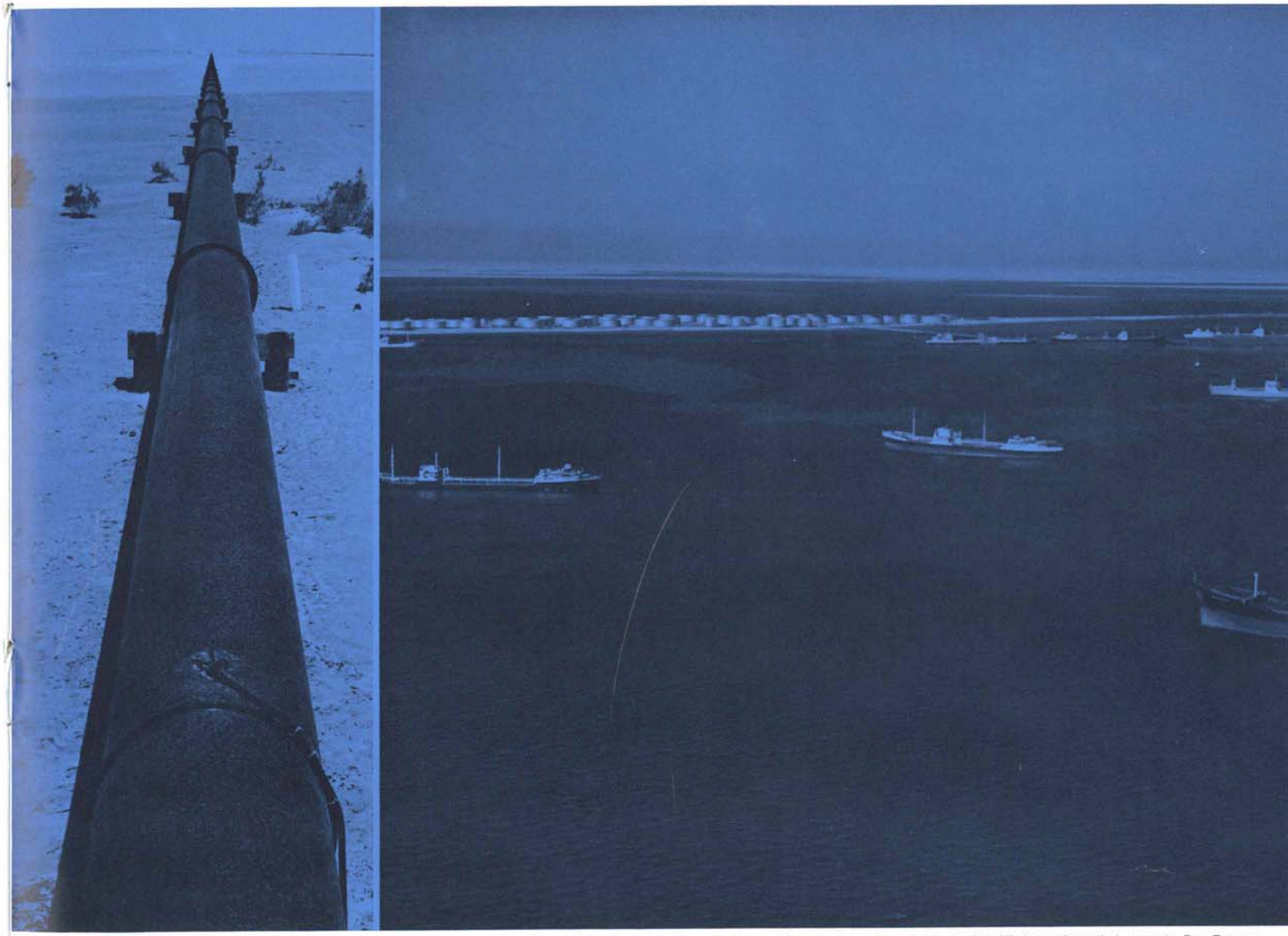
Yes, that could easily take an extra hour each day. Leaving two.

"Well, Mr. Sanuri always says that 'the fine art of oil dispatching is always to schedule your breakdowns when your tanks are full and no ships are steaming your way over the horizon.' "

So?

"Those other two hours," Ali smiles, "are what it takes to get yourself out of the mess when you don't."

John Ballantine is a former public relations writer now working in the Middle East as a free lance specialist on technical subjects.



It is the job of the oil dispatcher to see that the oil keeps flowing, whether through the Trans-Arabian pipeline or through the underwater lines that fill the tankers that come to Ras Tanura.

VALLEY OF THE MOON

BY JAN VAN OS

There are places on earth so weird yet so beautiful, so forbidding yet so irresistible that in his efforts to describe them man runs out of commonplace similes, gives up on his earthbound metaphors and turns instead to the unknown. Such a place is Wadi Ram, a great valley in southern Jordan, a vast silent place, so wild, so strange that it came, eventually, to be called the "Valley of the Moon."

The Wadi Ram is actually a great fracture in the surface of the earth, the result, probably, of some titanic upheaval that cracked great slabs of granite and sandstone like so many shards of pottery and heaved them upward in the form of great cliffs. It runs northeast to southeast in what is roughly a direct line between the lower end of the Dead Sea and the upper end of the Gulf of Aqaba.

It is only 35 miles from Aqaba to Wadi Ram and much of the distance can be covered swiftly on the smooth pavement of the Desert Highway that links Aqaba, Jordan's sole seaport, to Amman, Jordan's capital. About halfway between two villages called Kweira and Khirbet al-Khalidi, a dirt track strikes off across the desert. This is the road along which, it is thought, Colonel T.E. Lawrence led his raiders in World War I and along which, 40 years later, an American film company made its way to recreate the life of that colorful man amid the actual desert in which he rode and fought. For those who take that track it seems as if they have suddenly entered another world. As in many areas on the Arabian Peninsula, the traces of the unknown forces that battered the earth back in the dim past are still plain and inevitably they evoke the imagined emptiness of lunar plains and mountains, and the dry cracked beds of ancient seas.

Most mountains from a distance are shapeless, drab and identical. Not those at Wadi Ram. There, drenched in pale purple, they rear up off the valley floor, instantly and vividly alive. As distance lessens, the purple gives way to the tawny hues of sandstone ridges that tower a thousand

PHOTOGRAPHY BY THOMAS F. WALTERS

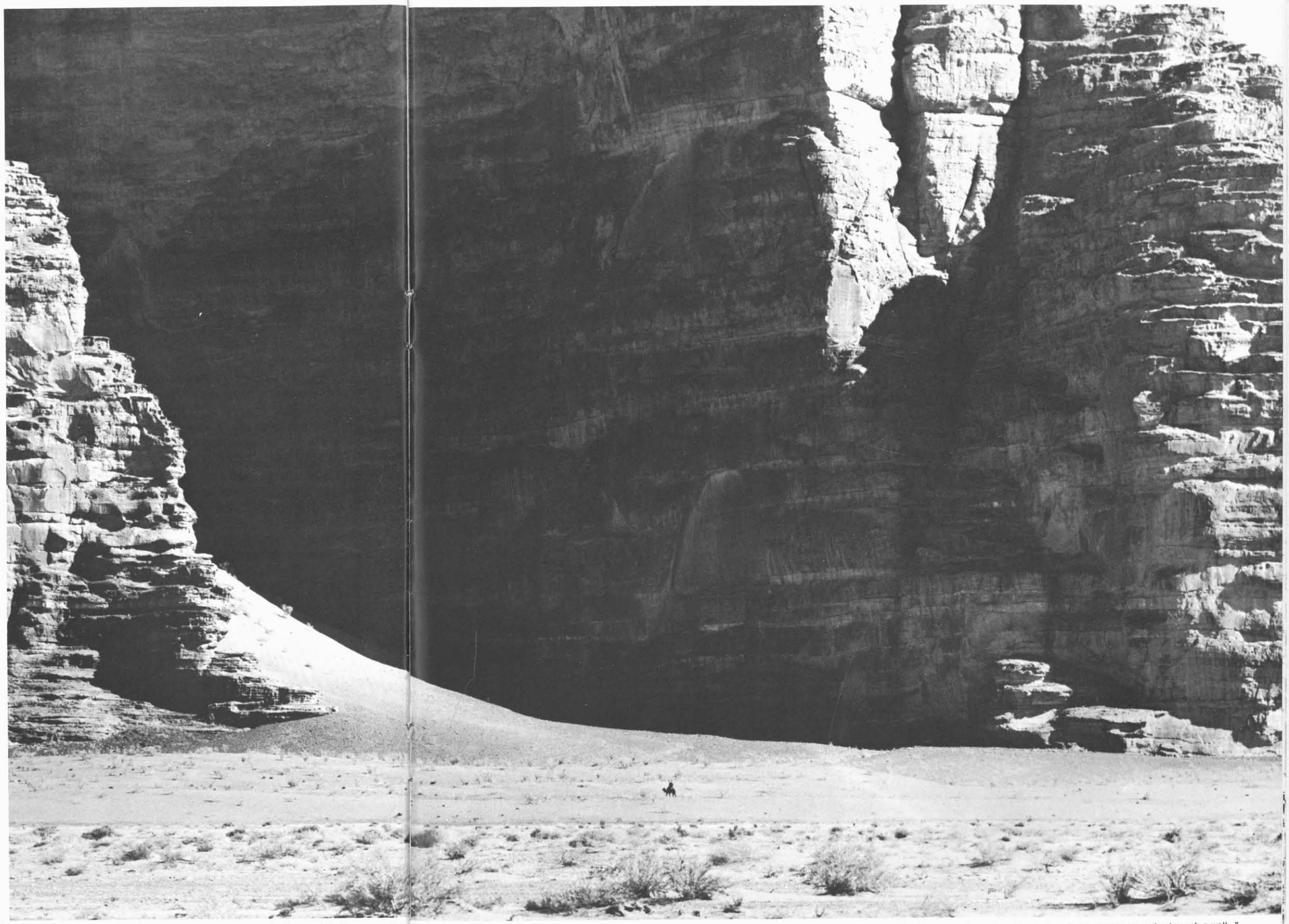
sheer feet in the air and are topped with domes worn smooth by a constant wind. The skies are pale and colorless and the sand underfoot and the fragments of rock at the base of the cliffs are dry and crisp with age. All around is emptiness and silence, the silence, it seems, of a land that man has not yet set foot upon or, having done so, has trod with quiet caution. The sound of a Land-Rover is suddenly loud and the size of it presumptuous amid spaces so immense they dwarf man and vehicle into insignificance.

To penetrate to the heart of Wadi Ram takes but an hour. Yet it is so far in time from the Desert Highway that the sight of a small settlement is startling. It is a cluster of tiny buildings standing in the center of a vast plain that lies between Jabal Ram on one side and Jabal Um Ishrin two thirds of a mile away on the other. Both are great segments of the high cliffs that Lawrence described as "crags like gigantic buildings along two sides of their street." There is a fortress there manned by a sergeant and five patrolmen of the Jordan Desert Police. There are a school and two small shops to serve a small settlement of Bedouins who, more or less regularly, set up their black tents nearby. The Bedouins camp there for the same reason that dictates the location of all their encampments—water. Up and down the wadi in the shadows of the great escarpments are small springs without which the valley—with summer temperatures of up to 140° F and no more than four inches of rain a year—would be uninhabitable.

The policemen, in the tradition of the Bedouins, which most of them used to be, are friendly and hospitable to all travelers. Each of them is assigned to the small outpost for a minimum of a year and although each man has a short leave every two weeks, life tends, eventually, to develop into a pattern of repetition and monotony that is broken only by the biweekly truck roaring into the stillness to bring supplies and pick up a man due for leave, or the approach of the rare visitor who has come to see the Wadi Ram. Thus they welcome company, offer coffee, answer questions willingly and, obviously aware of their splendidly romantic uniforms and their dashing headcloths, pose with enthusiasm against a spectacular backdrop.

One cannot go far in Jordan without coming across antiquities, and Wadi Ram is no exception. Half a mile from the police post, on a small hill, are the remains of a small temple, probably Nabatean and probably built in the first century. Excavations on the site started in the late fifties, but came to a halt when other projects were given precedence. There are also slabs of rock throughout the valley with inscriptions in early Thamudic writing, mostly the names of travelers of long ago, who were apparently moved by what Lawrence called "this processional way greater than imagination," and who vowed to leave some mark of their passing before they dwindled away and vanished in the vastness of time and distance.

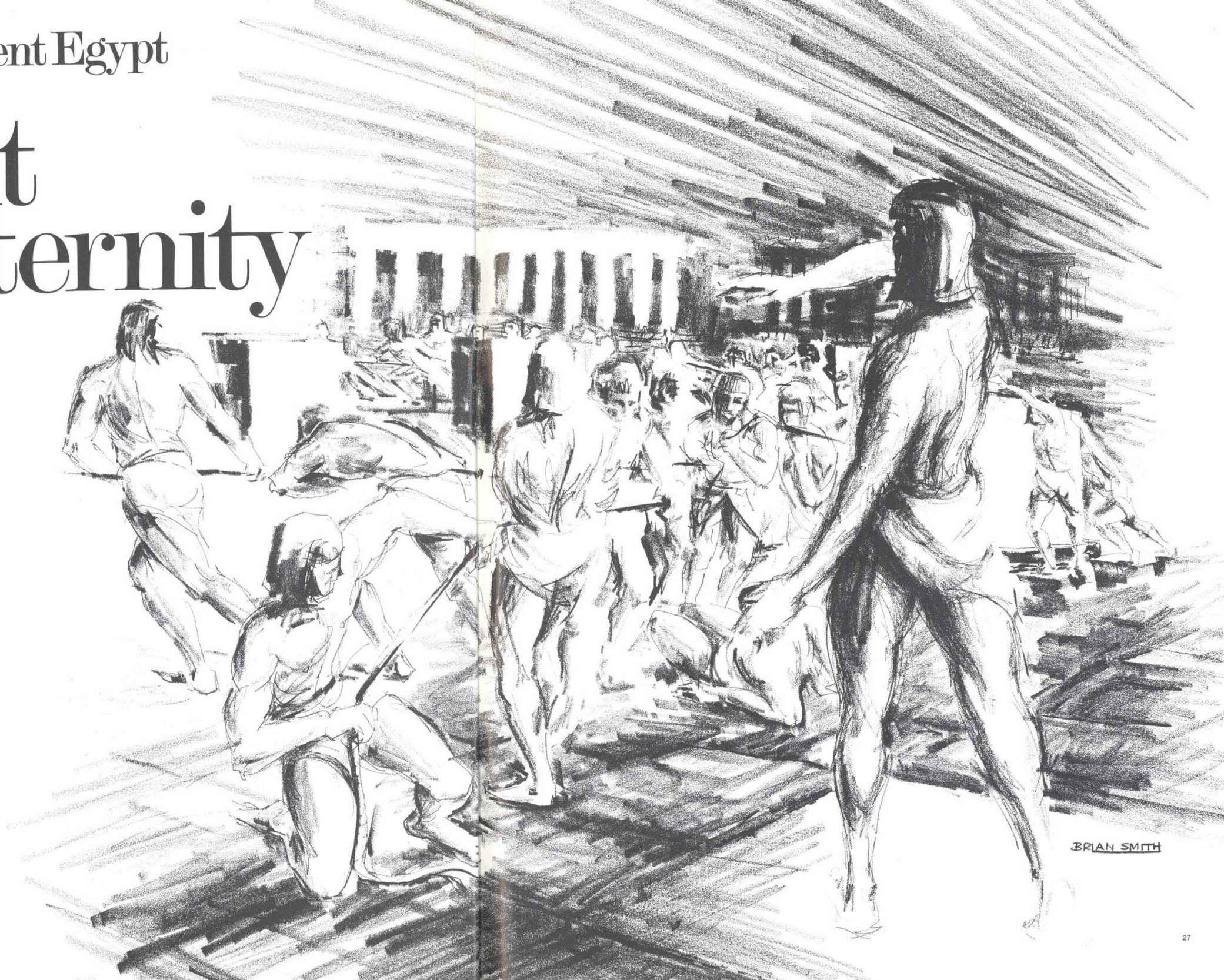
Jan van Os is Assistant Editor of Aramco World.



Scenes like this moved Lawrence to write: "To-day we rode for hours while the perspectives grew greater and more magnificent in ordered design, till a gap in the cliff-face opened on our right to a new wonder. The gap, perhaps three hundred yards across, was a crevice in such a wall..."

In Ancient Egypt They Built for Eternity

BY WILLIAM A. WARD



DRAWINGS BY BRIAN SMITH

Twenty-five centuries ago, when the Greek traveler Herodotus visited the already ancient monuments of Egypt, he found that the tourists had gotten there first. Their names were scratched on the crumbling ruins in hundreds of ancient languages.

Tourists are still coming to Egypt and are probably still inscribing their names on the old stones. They are probably sharing another experience too—standing in silent and involuntary admiration before the great structures and silently posing those inevitable questions: Why? How?

The why is easy: religious beliefs that sought perpetuation in masses of stone so ponderous they must be measured in tons and acres and that demanded that these material manifestations of faith be not only huge but permanent. In the words of Ramses II, who dedicated the magnificent temple of Medinet Habu in the 13th century B.C., this was to be "a palace of the Lord of the Gods, *forever*." The Egyptians built for eternity.

The real wonder, however, is that the monuments were even contemplated. The ancient Egyptians possessed only the simplest hand tools and lacked what today would be considered the most elementary machinery. They didn't use the wheel until the Great Pyramid had stood a thousand years and never used the pulley at all. Yet the monuments they left stagger the imagination. The Step Pyramid complex at Saqqara, built nearly 4,800 years ago, is enclosed by a dressed stone wall one mile in circumference. At Karnak visitors can walk for hours through forests of columns and gateways without seeing the whole temple. How were they constructed?

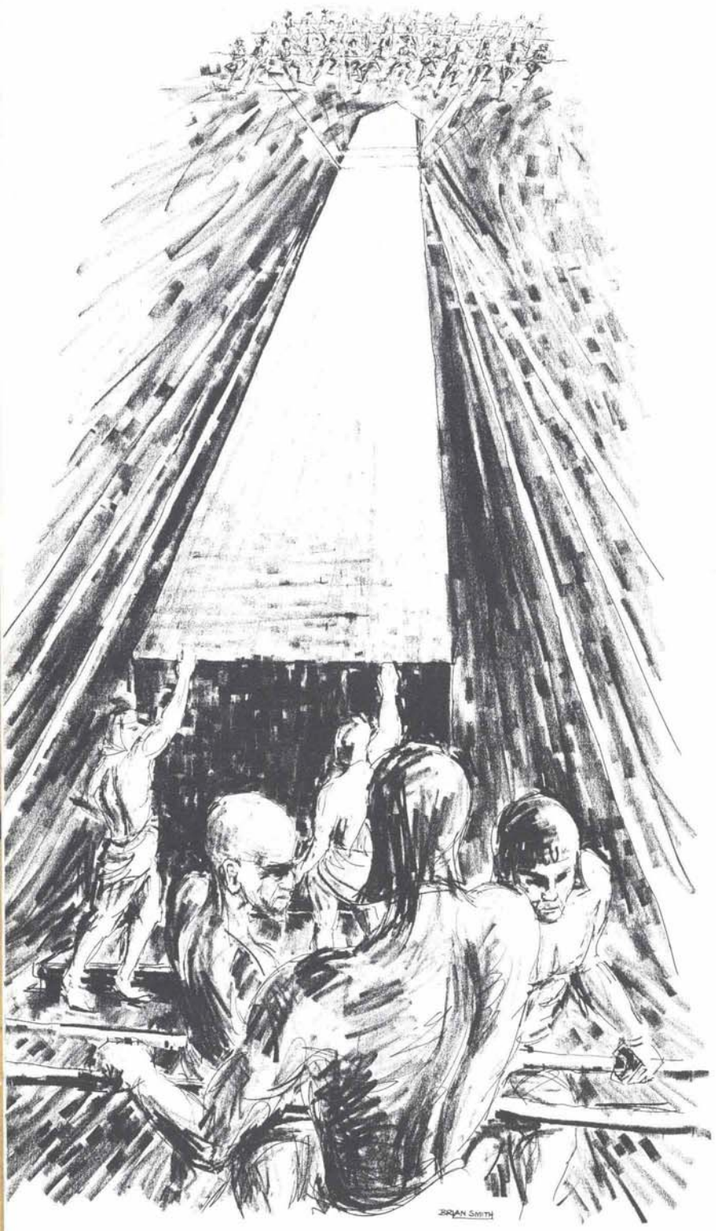
In ancient Egypt the quarrying, transport and erection of obelisks—symbolic stone shafts representing the sun—were common problems. And in their solution can be found answers to many questions on how ancient Egyptians achieved what appear to be miracles of construction. From records left by the Egyptians it appears that the huge obelisks—single shafts of granite up to 100 feet high and weighing 500 tons—were usually quarried at Aswan. When an obelisk was needed, stone cutters at Aswan would search the quarry for a mass of rock free of faults and large enough to permit a segment of stone the size of an obelisk to be cut out in one piece. They would mark off the general outline of the obelisk on the smoothed flat surface and undertake to separate the monolith from the parent mass, sometimes cutting it free with ball-hammers of a hard stone such as dolerite, other times employing a more complex method. In a shallow slit chiseled into the rock and outlining the shape the stonecutters bored holes at regular intervals, drove in wooden wedges and soaked them. As the water seeped into them the wedges expanded slowly, splitting the rock along the chiseled lines until the whole monolith came free. After rough shaping and dressing it was transported to the building site.

Moving a block of stone this size was an exercise in brute strength. From Aswan—where an unfinished obelisk of enormous proportions lies to this day—they were usually floated along the Nile. But that meant that first the volume—and hence the weight—of the stone had to be calculated. This was done, according to data found on mathematical papyri, with exactly the same formula used today to calculate the volume of a truncated pyramid, a figure of the same geometric type as an obelisk.

Having established the weight of the obelisk the engineers could go ahead with the rest of the planning: estimating the number of laborers who would be needed, making arrangements for the laborers to be found and brought to the quarry, calculating the size of the log raft needed to float the obelisk, finding timber and transporting it to the quarry and getting construction started. It was a complicated task and even after the raft had been built and the obelisk rolled over onto it there was still considerable work ahead. A canal had to be dug in which at the time of the annual Nile flood, when the river waters spread out over the whole valley, the raft could be floated to the river proper with little difficulty. Such canals were dug by hand, first from a point near the quarry to the river, and then from the river to the building site. After the stonecutters had polished the obelisk to a smooth finish and cut inscriptions into its surface, the engineers launched the final operation: raising the great shaft to a standing position, one of the most fascinating feats achieved in the ancient world.

Prior to the arrival of the obelisk an incline of earth or sand, held in place by brick retaining walls, was built at the point where the obelisk was to stand. The incline covered the obelisk base. After the obelisk was unloaded from its raft at the site, teams of men dragged it up the incline with ropes, the lower end first. More laborers then went to work excavating the sand beneath the lower end so that gradually the end of the obelisk began to tilt downward into a near vertical position. Eventually one edge could be guided into a groove in the base. At that point hundreds of laborers in teams—hauling on guide lines—pulled it into an upright position. The rest of the incline and the retaining walls were then removed and the obelisk was left standing free and firm, and able, as has proven true, to stand for thousands of years.

That, anyway, is the theory and although the supporting evidence is sound, there are still a few points which remain hypothetical and other points which are still being disputed. For example, according to the records obelisks were transported on log rafts. But there is pictorial evidence from Queen Hatsheput's mortuary temple at Deir el-Bahri that obelisks were carried down the Nile in boats. A large relief shows two obelisks on the deck of a barge in the traditional shape of a sailing-boat hull being towed by 30 rowing boats. In one of the inscriptions



from this temple, the word for "boat" is carved in hieroglyphs using a picture of such a barge carrying an obelisk. On the other hand, from what is known of Egyptian ship construction, a heavy load like that would have capsized any ship built along normal lines. There are some who tend to believe that the Egyptians possessed adequate knowledge to build boats capable of hauling obelisks in this fashion, but real boats found in excavations certainly do not bear this out. The theories are still theories.

The single most ambitious enterprise undertaken in ancient Egypt was of course the largest—and today the best known—of the pyramids of Gizeh. This monument covers 13 acres at the base and in its original condition stood 481 feet high and was constructed of about 2,300,000 blocks of stone, each weighing about 2½ tons. Yet although it is the most famous and the most familiar, the question "How did they do it?" still can't be answered fully. It is known that it was built without the use of either wheels or pulleys, but conjecture still plays and always has played a large part in the answers. Herodotus, for example, recording stories he heard from Egyptian priests, describes wooden machines which, he says, were used to lift the heavy stones from one level to another. Through the years the idea developed and spread that the Egyptians had discovered and hidden away secret methods and machinery. Actually the pyramid, even in the time of Herodotus, was already 2,000 years old and the truth had long since been swallowed up in legend and superstition.

But even though hypothetical, even the most reasonable theories explaining the pyramids are no less interesting than the fantastic theories produced by imaginative amateurs. Each of the 2,300,000 blocks, for example, had to be measured, cut, dressed, polished, moved, floated, moved again and put in place in almost precisely the same way that the obelisks were. To put it another way, the problems involved in constructing the pyramid were exactly the same as those of erecting obelisks but multiplied two million times!

As in any building project, the first problem that confronted those ancient engineers was how to obtain raw materials. It was a problem of unprecedented magnitude. They needed granite slabs for the inner chambers. They needed huge blocks of yellow limestone for the main courses. They needed white limestone for facing, tons of copper to make the tens of thousands of tools, enormous supplies of palm, flax and papyrus fibers with which to make rope to haul and pull and lift, and great quantities of wood to build rafts, sledges, levers and rollers. To meet these needs expeditions set forth in all directions. For granite they went to Aswan. For yellow limestone they went into the local hills. For white limestone they went to Turah, a few miles from Gizeh. They went to Sinai, too, for copper, and to the mountains of Lebanon for timber. In short, they ranged throughout the Middle East, simultaneously setting in motion mining, quarrying, lumbering and transportation projects of a scope that would be impressive even today.

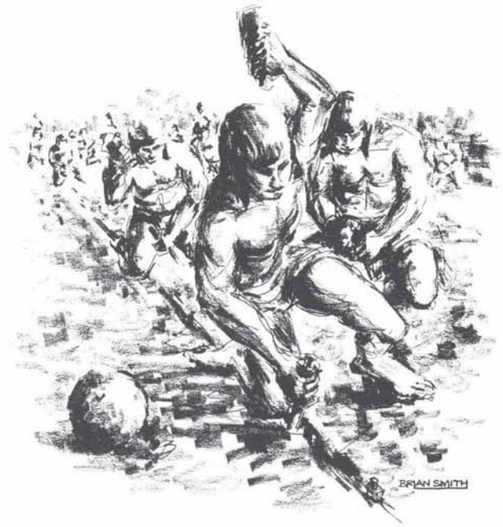
The personnel problems were of similar proportions. Although, as inscriptions indicate, laborers made up the bulk of these expeditions, there were hosts of specialists too: masons, transport crews, military contingents, interpreters, a small army of scribes and—a typically Egyptian detail—scorpion charmers to deal with these vicious creatures. Physicians were also included since, contrary to the myths about cruel Egyptian taskmasters, workmen were much too valuable to be either whipped to death or left to die under the desert sun.

At the building site itself another army of workmen was required—laborers, masons, overseers, architects and thousands of service personnel. The total number involved in building the Great Pyramid was estimated in Herodotus' day as 100,000 men and a more recent estimate, made by a qualified archeologist, puts the figure at 250,000. In either case, the problems of organization, of housing and feeding them—for a period of 20 years—would have been staggering since these workers (again contrary to popular notions) were *not* slaves, but the free population of Egypt, most of whom worked for and were paid by the state. This was during the months when there was no farming. In the growing seasons they returned to the fields, leaving a skeleton crew of artisans behind to quarry stone, manufacture tools, dress the building blocks and make other preparations for the next season of construction.

The core of the pyramid was built in horizontal courses, rising like steps, each level a bit smaller than the step below. Since several courses make a truncated pyramid, the mathematical formula noted earlier in reference to obelisks played a vital role. With it the Chief Architect could calculate the total volume of several courses of stone, determine well in advance the materials, workmen and tools which would be needed for the coming season's construction and order the requisite amounts from the far-flung sources of supply.

As the courses of the pyramid rose higher, inclines of sand and rubble were constructed along each side. These slopes were fitted crossways with logs to facilitate the movement of wooden sledges on which the building-stones were dragged up to the ever rising surface. Once the core of the pyramid was finished, the outer casing of triangular stones—which, in effect, filled in the steps—was laid on. Since the inclines rose all the way to the top, the casing stones were added beginning at the peak. As the work on the casing proceeded downward, the inclines were gradually removed until the lowest course was finished and the monument stood free as a true pyramid, with its smooth sides sloping down in an unbroken white surface from peak to base. Unhappily, over the centuries these limestone casing blocks have been removed for other buildings, except for a few at the base. As a result, only the stepped core of the pyramid remains today.

The pyramid itself is little more than a tombstone marking a royal burial. In most pyramids the burial chamber is at or below ground level, reached through a passageway leading from a hidden entrance on the north side. In



the Great Pyramid, changes in plan during construction created two chambers in the pyramid itself and one below ground level, all with the appropriate passageways. (A change in plan while building was in progress was frequent in Egyptian architecture.) The chambers in the Great Pyramid proper are mostly of granite and show certain unique characteristics. The Grand Gallery, part of the passage ascending to the burial chamber, is 153 feet long and 28 feet high. The upper three-fourths of the walls form a huge corbel vault the entire length of the gallery. The burial chamber at the upper end of the gallery is of granite and is topped by five low chambers and a peaked roof, also of granite slabs which average 50 tons each. This construction prevented the ponderous weight of the pyramid from crushing the burial chamber and is found in simpler form in several other pyramids.

The pyramid proper was only part of the total burial monument. A temple was built on the east side and a long stone causeway led from this temple down to the riverbank where a second temple stood. Each pyramid complex originally contained all these elements, though much has been destroyed. The causeway foundation was one of the first parts to be constructed, as this afforded a convenient path for dragging the building-stones up from the rafts at the river's edge.

The construction of rock-cut tombs demanded many of the same techniques as those used in the stone quarries. Excavating a rock-cut tomb simply meant quarrying passages and chambers out of living rock. Depending on the kind of stone, ball-hammers or metal hand tools were used to cut into the face of the cliff. Softer stone was chipped out in small pieces, harder stone was removed in blocks to be used later in other structures. Natural pillars were left in the larger galleries to support the mass above. The entire surface of such a man-made cave was then smoothed and covered with sculptured reliefs and inscriptions. If the stone was of poor quality, the walls were either painted or covered with a thick plaster

surface in which the reliefs and inscriptions were cut.

This kind of structure presented less of a problem than a monument constructed of stone blocks. There was no massive transport of building materials involved and the labor force was certainly less. The total bulk of stone moved was, of course, proportionately smaller. The rock-cut tomb of King Merneptah (1223-1211 B.C.), for example, has a volume of approximately 6,000 cubic yards, almost negligible when compared to about 2,500,000 cubic yards for the Great Pyramid. Still, it is difficult to descend into one of the rock-cut tombs, particularly those of the Valley of the Kings, without admiring the often spectacular results. No less than the pyramids, the rock-cut tombs were engineering feats of considerable skill, considering that they were carved out of solid mountains entirely by hand.

By contrast, the construction of great temples, which would seemingly have presented great engineering difficulties, was relatively easy. Even a large temple hall with rows of tall columns, high walls and a massive stone roof required only adaptations of the same methods as those employed for obelisks, such as filling the entire area of a hall or temple or palace with earth and rubble as columns were put up. The columns were built of separate drums placed one upon another much as walls were built of separate layers of blocks. Thus the walls, gateways and columns all rose at the same rate and height, and the level, packed sand rose with each course of stone. By the time the stone roofing was laid on the building was completely filled with sand with huge inclines sloping off to ground level. After the building was completed, the earth filling and inclines were patiently removed in small reed baskets carried on the hips and shoulders of the workers—exactly as it is done today on many construction projects in the Middle East. At last, sometimes decades later, the temple would emerge, a testament to the skill and resourcefulness of builders and craftsmen who will forever remain unknown.

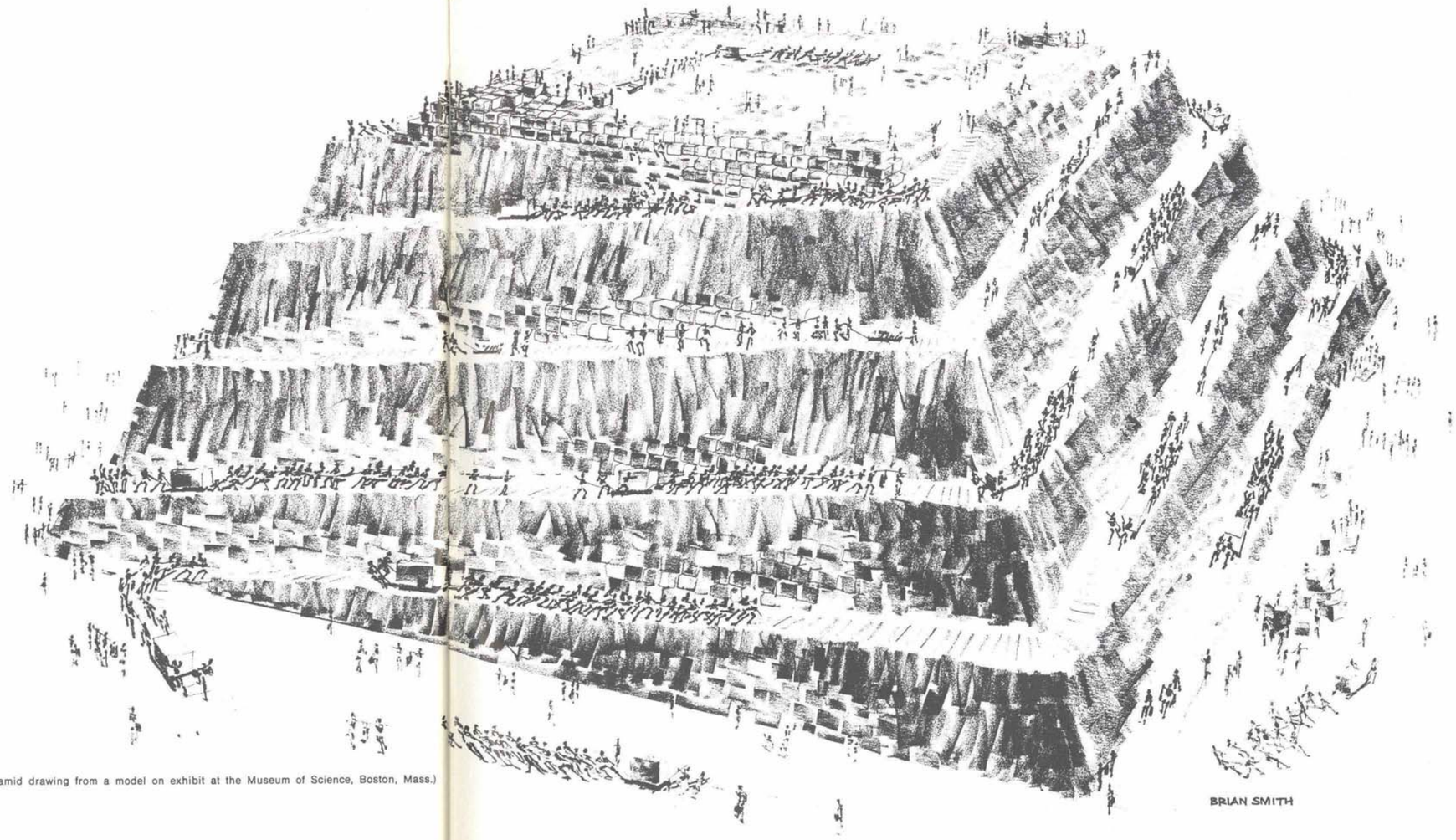
It should be added, perhaps, that the hypotheses concerning such construction are based largely on what the Egyptians themselves have said, in the form of completed and unfinished monuments as well as many types of inscriptions. Scenes on the walls of tomb chapels show that teams of men or oxen were used to drag stones weighing several tons. Names of individual work crews appear on blocks of stone they moved. Texts record the construction of either boats or barges for the transport of stones. There is even a written record of the erection of a huge royal statue which describes an earthen incline up which the statue was dragged, base first, to be lowered into position in the manner used to erect an obelisk. Another papyrus preserves the specifications for a brick-enclosed incline more than 1,200 feet long and 100 feet high at the upper end and the actual remains of such inclines have been discovered at many sites in association with several types of structures.

There is also ample evidence that hand tools were the basic means of cutting even the largest blocks and excavating tombs. Egyptian reliefs show workmen using them; many of these tools have been discovered in the course of modern excavations; and the markings left by chisels, adzes—small axes with arched blades—and ball-hammers are visible everywhere in tombs and quarries. (Even today in the Middle East workmen can be seen using identical tools, squatting in identical positions patiently chipping away at blocks of stone intended for the most modern buildings.)

The slits, cut in stone to receive wooden wedges for splitting large blocks from the parent mass, can be seen by the thousands in the Aswan quarries. There is debris in the quarries, suggesting that rough dressing and shaping were carried on in the quarry. And, finally, there are architectural drawings so accurate that the actual monuments they represent can sometimes be identified. The architect's plan for the tomb of Ramses IV includes measurements for the various corridors and galleries. One plan for a private estate even shows the trees in the garden, and on a fragment of pottery of the 21st century B.C. a landscape architect plotted the grove of trees that once stood before the earlier temple at Deir el-Bahri.

For all that, it is still difficult to accept the fact that some of the most astounding engineering of the world was accomplished with tools no more complex than chisels, stakes, ropes, water and sand, possibly because in the modern world simple solutions are so rare. Yet the pyramids are there and no mysterious mechanical devices, no hidden secrets, no lost knowledge have ever been unearthed to explain their presence. And it is doubtful, to say the least, that they ever will. The Egyptians excelled in building great monuments with elementary techniques because they were blessed with practical minds and limitless time. This, and an inherent belief in their own grandeur, enabled them to build for eternity.

William A. Ward, an Egyptologist and archeologist, holds a Ph.D. in Semitic languages and teaches ancient history at the American University of Beirut. He has published one book and a score of articles in professional journals in the United States, Europe and the Middle East.



(Pyramid drawing from a model on exhibit at the Museum of Science, Boston, Mass.)