Islamic Contributions to Civilization

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Stanwood Cobb

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About the Author

STANWOOD COBB was born in Newton, Mass. In 1881. He attended Newton High School and Dartmouth College. In graduate work at Harvard he specialized in the history and philosophy of religion. He then taught for three years at Robert College, Istanbul, and in 1914 published a book, based on his experiences in the Orient-one of the first books in America to give sympathetic treatment to the Turk and to Islam.

In 1919 Stanwood Cobb founded the Progressive Education Association of which he was later president. That same year he also founded the Chevy Chase Country Day School in Washington. He is a member of the Cosmos Club and is founder and president of the Washington Authors Club.

Introduction

MY interest in Islam dates from the time I lived in Istanbul, teaching at Robert College. I soon felt at home with the educated Turk. In fact, one of my closest friends then, and ever since, was a young Turkish teacher, a liberal Muslim, subsequently dean of the college.
As I moved among the common people I was particularly struck with their serenity and calm at all times. Along the quai of the Bosphorus, for example, one had an opportunity to see the
difference in temperament which set the Muslim trader apart from his competitors. While others were always on the watch for customers, shouting loudly and waving as they saw potential patronage, and often jumping out of their boats in order to induce trade, the Muslim sat in lordly calm, waiting in peace for whatever customer Allah willed to send him. Actually, this attitude was more persuasive to us than the hurry-scurry of the Greek and Armenian boatmen, whom we brushed aside in order to reach the boat of a Turk.

This Muslim attitude of immense calm in the midst of the life of commerce was even more noticeable in the Istanbul bazaars. There many of the rug merchants sat in front of their bazaars in order to entice passers-by. But the Turkish rug dealers sat calmly on a platform in the rear of their bazaars, not deigning to move until you had found a rug you were interested in and asked them its price. It was the custom of the Turk to name a price about twenty-five per cent more than normal, and come down to normal in the course of that bargaining which then was an indispensable element of commercial life in the East. On the other hand, it was the custom of many other rug merchants to name to greenhorns a price three or four times greater than normal. American tourists, having been told that one should always bargain, would take delight in bringing the price down to half the original amount demanded and go away proud of their bargaining skill -- not knowing that they had paid in the end twice the normal value.

The Turks were not only honest as merchants, but they were also honest as servants. It was a common saying among the American missionaries that if one by accident lost an article in a Turkish village, nine times out of ten it would be returned. This was hardly true in other Eastern villages. Common pilfering seems to have been stamped out early in the history of Islam by the very stringent rules enforced against it. I was amazed in a Turkish town, to see a haberdashery stall open to the sidewalk left entirely unguarded on a Friday while the proprietor was attending mosque service.

The piety of the Turk, his faith in Allah, evidenced as calmness in the midst of the busy life of the world, was evidenced as reverence in the daily prayer and in the Friday mosque service. Previous to the Young Turk Revolution in 1908 non-Muslims had never been allowed to enter a mosque during such a service, which remained perforce somewhat a mystery to Western historians. But the Young Turks, taking pride in being cosmopolitan, decided to open the Friday service to any and all, similarly to the Christian custom.

I thus had an Opportunity to attend a mosque service in St. Sophia and observe

the kind of service which took place. Much of it consisted of genuflection. The worshippers, as they prayed, would repeatedly fall to their knees, then place the palms of their hands on the floor, rise and lift their palms on high. There was also a short sermon.

I was greatly struck with the reverence expressed by these worshippers -- a much greater reverence than I was to observe later in a week's tour of Mount Athos, the stronghold of monasticism of the Eastern Catholic Church. In fact, I had never witnessed such intensity of worship in any Christian church.

Later that year I had the privilege, with a few other foreigners, of watching from a high balcony the annual celebration of the 'Night of Power', the night in which the Koran was supposed to have descended from heaven. The floor of St. Sophia was packed with some five thousand worshippers, who fell to the floor and rose in absolute rhythm. The thud of their knees, then of their palms, their swift rise again -- all this was as synchronous as the wheelings of a huge flock of birds. It was an awe-inspiring spectacle.

In addition to deep reverence the Muslim worship was also characterized by a spirit of absolute democracy and brotherhood. I saw street porters in clean rags stand or kneel side by side with rich pashas in furs. I saw burly negroes worshipping alongside dainty Turkish fops of the city. Islam from its very beginning was a vital brotherhood, and it has remained so to this day.

* * *

But what has all this to do with 'Islamic Contributions to Civilization'? My purpose here is to create an atmosphere, to create a subjective approach to an objective subject. For the history of Islam can never be appreciated save by those who realize somewhat its inner spirit and the effect of this inner spirit in conferring some degree of dignity and tranquility to the life even of the common man.

I can testify to this in a personal way. For I came home from Turkey a rather changed man -- less intense in facing disappointments, less nervous and less apprehensive. Thus does the tranquility of the Orient steal in upon one.

Therefore, I ask the reader (in case he reads the introduction first, as few do) to approach this history of the Arab-Islamic culture in a sympathetic mood. To understand a people we have to try to feel as they do. And to understand an epoch we need to imagine ourselves as living in it.

Stanwood Cobb

Chevy Chase, Md.

I

A Blind Spot in History

EVEN in this modern age of enlightenment few people are aware of the significant contributions made by the Islamic world to the progress of humanity. Yet for more than five centuries that civilization not only led the

world in science, but was the only portion of mankind actively engaged in the systematic pursuit of knowledge.

Beginning with the rise to power of Baghdad in the mid-eighth century and continuing beyond Islamic political decline five hundred years later, science and education flourished under Muslim influence. No such activity characterized any other part of the contemporary world. The lights of Graeco-Roman culture had been extinguished and Europe was engulfed in the Dark Ages; India was languishing in a period of stagnation; and China, while blossoming richly in the arts, was almost wholly devoid of science.

These contrasting facts are little known for several reasons. For far too long our histories have concentrated on the rise and fall of empires, the militaristic clash of nations, and the succession of dynasties. Only lately have historians begun to trace the rise of civilization itself. Moreover, until relatively recently the West remained insular. Not until the Age of Enlightenment and the French Revolution did the history, arts and religions of Oriental countries begin to interest the Western mind.

The inherent conflict between Islam and Christendom further contributed to the indifference -- if not hostility -- of West to East. The Crusades are a vivid evidence of the acerbated relationship which existed between these two great religions. Up to the nineteenth century it was as if a gigantic curtain separated the cultures of Islam and Christianity.

Lack of proficiency in the Arabic language has also been a considerable obstacle. Until the present century, few Western scholars could read, let alone translate, this once fluent tongue.
It is not, however, the purpose of this book to lament the past limitations which have tended to circumscribe peoples and civilizations. Today we may rejoice that in every part of the world -- Orient and Occident alike -- scholars are viewing history objectively and comprehensively. One of the first modern historians fully to realize the importance of Arabic for the study of world history was George Sarton, World War I Belgian refugee who found scholastic sanctuary at Harvard and continued there for years his valuable studies in Orientalism as well as his editorship of the magazine, 'Isis'. His epoch-making work, 'An Introduction to the History of Science', was the very first to give due credit to the Arabic-Islamic culture as regards the proportion and weight of its contributions to civilization. We are also greatly indebted to Philip K. Hitti, professor of Semitic literature at Princeton, for his 'History of the Arabs', a treasure-trove of information about Arab culture in the Middle East and in Spain.

To a substantial extent the story of civilization finds its best expression in the works of anthropologists who study not so much countries as man himself - man as he has striven forward from the dimness of cave life to the dawn of the Space Age.
In this story of man the Arab-Islamic period forms a very important chapter. It was one of the world's three great scientific epochs, standing midway and

providing a link between the embryonic science of the Greeks and the birth of modern science and technology.

The rise of Muslim rule was dramatic. So also was its decline to the point where in 1492 the Caliph Abdullah abandoned Granada to the conquering Spaniards, "weeping like a woman for what he could not defend like a man."

But how did this expiring culture hand on to Europe the torch of scientific enlightenment which was soon to set all Christendom aglow? And through what channels did the Western world come to possess the accumulated knowledge of prior ages on which she was to base her momentous progress? Herein lies a fascinating episode in the drama of civilization.

II

Out of the Desert

THE seventh century which saw the rise of Islam also saw Christian Europe enter the Dark Ages. In the western area the invading Goths had almost obliterated the culture and technology of the Romans. In the Eastern Roman Empire, centering in Constantinople, the Church had all but suppressed Greek science and philosophy.

Both the Lyceum at Athens, so long the center of Greek thought, and the Museum in Alexandria, had been closed down. Greek scholars, pagan as well as Nestorian Christian, had either been expelled from Constantinople or had migrated to Syria in order to escape persecution.

It was during the period of the decline of Greek learning that the Arabs moved ahead to become the vanguard of civilization. This crude people was presently to dominate half the known world, revive the dying culture and science of the Greeks, and transmit to dormant Europe the knowledge and skills gleaned from the classic age.

The cultural change in this desert race was brought about by one of the most remarkable figures in history. Western scholars differ as to Muhammad's character and the source of his inspiration, but all acknowledge the extraordinary influence he exerted on the Arab people, and the transforming progress they made under his stimulation and direction.

Born around 570 A.D. and orphaned at an early age, Muhammad spent much of his childhood and youth accompanying his uncle on long journeys through Arabia and Syria. During these travels he heard of the God of Israel and of Christ, and as he grew to manhood he spent much time in spiritual reflection. Inspired by a vision at the age of forty, he felt himself called to be a prophet of God (Allah) and so began his teachings as the leader of Islam, ("submission" to God).

The initial rejection of his religious ethics and morality in certain quarters forced him to flee from Mecca in 622 (the Hegira, which now marks the beginning of the Muslim calendar). It was in nearby Medina, where he had a large following, that his influence began. Spreading the gospel of Allah through

Arabia, he was able to unite warring tribes and start these semi-barbarous people on the road to civilization. At the end of a decade he was the undisputed ruler of a united Arab nation and was receiving embassies from foreign countries.

The influence of the religion which Muhammad gave his people did not diminish after his death in 612. On the contrary, it increased year by year through the Koran, the sacred book believed to have been revealed from heaven to the Prophet. Though caliphs came and went, though military commanders were capable or inept, the power of the Koran kept the Arabs true to their course and maintained that spirit of unity for which Muhammad had laid the foundations.

2

The Middle East at this time was chaotic and ripe for conquest. It was a political vacuum in which the mixed population had no effective loyalties. The region had been successively conquered by the Chaldeans, Assyrians, Persians, Greeks and Romans, and remnants of all these now composed the population. Not only the weight of constant warfare, but the heavy burden of an iniquitous taxation lay upon the peasantry, planting the seeds of ready revolt.

In Syria, now under the rule of Constantinople, there was both political discontent and religious unrest. The Eastern Church had persecuted those Christians whose Nestorian belief and practice they considered heretical. This alienated body of Christendom gained further strength in Syria as sectarians fled or emigrated from Constantinople to escape similar oppression.

Here, if ever, was a situation that invited the injection of new blood, new enthusiasms, and a new order of existence. The Arabs, fired with zeal in their new political-religious Faith, stood ready to furnish all three.

Abu Bakr, Muhammad's successor and first Caliph of Islam, lost no time in initiating a series of conquests which soon brought the whole Middle East, Egypt and North Africa under Muslim rule.

The Eastern Roman Empire was open to penetration by vigorous attack, all the more so because the Islamic invaders offered better social and economic conditions than those which prevailed.

Syria, adjacent to Arabia and weakened by disaffection and discord, was the first logical target for Arab assault. In addition to the impotence of Roman rule, the Muslims had a further advantage in that much of the population of the region, Arabs who had migrated into the Fertile Crescent over the course of centuries, was of similar stock. As the Muslims moved into Syria they gained new adherents from among these kindred masses. In accordance with the teachings of Muhammad, the armies of Islam were careful to abuse neither the countryside nor its inhabitants. In fact, the orders later given by the Caliph Ali regarding merciful treatment of non-combatants was the first humanitarian step taken in the history of warfare.

Arab rule introduced a more stable situation than any previously known in the

Middle East. The condition of the peasants was improved by means of new and more democratic land division and less stringent taxation. Many of the conquered peoples enlisted in the armies of Islam, becoming Muslims in order to do so. As such they were freed from taxation and permitted to share in the rich booty of future conquests.

Thus the military power of Islam gained momentum as swiftly as an avalanche. With the fall of Damascus in 635 A.D., all Syria came under Arab rule. Palestine and Phoenicia soon followed.
Egypt was the next country on which the Arabs loosed their conquering hosts. As with Syria, the oppression of harsh Roman rule and the bigotry of the Eastern Roman Church rendered this ancient country vulnerable. The field-marshal Amru, a most capable general, invaded the valley of the Nile with a force of only 4,000 men and easily established himself on the right bank of the Nile; and later, through the desertion of a large part of the Egyptian army, obtained possession of all Egypt except Alexandria. This key city, greatest center of Greek culture since its founding in 330 B.C. by Alexander, was finally captured in 641 after a stubborn siege of fourteen months.

It remained for the mighty warrior Omar, Islam's second caliph, to annex the one remaining power in the Near East, the still potent Persian Empire. It is doubtful that this conquest could have been achieved had not the Muslims of Arabia added to their ranks the enlistments from Syria previously mentioned. Not only was much needed military equipment acquired, but the Arabs gained a body of soldiery well trained under Roman rule in the arts of warfare.

In 635 A.D. Khaled, "the sword of Allah," one of the greatest military geniuses that Islam produced, inaugurated attacks on various outposts of the vast Persian Empire.

Through his victory at Hira; he gained possession of the whole region west of the Euphrates. Four years later the Arabs undertook the invasion of Persia itself. The battle of Nehavend, one of the decisive battles of history, took place in 641. There a large force was defeated, and all Persia lay in the power of Islam. Within a few decades from the death of its Prophet, the Arab nation ruled from the gates of India to the Straits of Gibraltar.

3

This seeming miracle was the result of various factors, some of which have already been discussed. But more than anything else, it was due to the religious zeal which possessed the Muslims. Within the lifetime of the Prophet they had already been forged into a militant and powerful body, and after his death victory led on to victory. An inner force, an élan and daring sustained the Arabs in all their military enterprises, and they began to feel themselves invincible. No fear of death kept them from wielding the sword for Allah. For Muhammad had declared that all who fell in holy wars would be received immediately into Paradise. On the other hand, when an Arab had complained during a summer campaign that the sun was too hot for fighting, the Prophet had looked at him warningly and said: "Hell is hotter!"

It must be realized that this was not solely an Arabic campaign and victory. Men of other racial backgrounds and religious faiths were attracted to their ranks. For these hardy desert warriors possessed a magnetic quality unknown to the more refined and cultivated races whom they fought. They were capable of fighting to the death for a principle.

III

The Arabic-islamic Civilization

WITH the conquest of Spain in 711 AD. (described in the following chapter) a vast and variegated stretch of territory was now under Arab domination. Islam had gained a sphere of influence more extensive than the Roman Empire; for in addition to Spain and North Africa, it embraced Oriental regions never affected by the pax Romana.

Faced with the task of achieving order and harmony throughout this sprawling empire, the new rulers were for a while too occupied with military enterprise and administrative problems to consider the opportunities for cultural expansion.

Yet in establishing peace and unity they were actually laying the foundations for a great Islamic civilization which was to realize Alexander's ancient dream of amalgamating the Occident and the Orient and mingling the two world cultures. The seeds of unification which the Greek conqueror and visionary had planted from India to Egypt were to provide a rich harvest for Islam, and hence for much of the world.

Alexander had planned before his death to create from simplified Greek a universal language. Such a plan was actually carried out by the Muslims, and Arabic became the predominant tongue from India to Spain. Wherever the Arabs conquered they remained as rulers and chief administrators. But as their numbers were limited, they gradually built up native bureaucracies trained in the expression of Arabic. The language of the conquerors thus became the language not only of the court, but also of administration and soon of all higher education.

2

With the possession of a common language and with a common rule under the aegis of Allah, this Islamic region enjoyed for the first time in history the blessings of peace. Racial energies which had been wasted in internecine warfare were turned into channels which led to prosperity and progress.

The dawn of Islamic culture and technology broke first in the newly founded city of Baghdad, which became the archetype of an urban civilization that began to spread throughout the Muslim world. Its location on the banks of the Tigris was ideal for Islam's capital city. Accessible to all the water traffic of the Tigris and Euphrates, and situated at the natural hub of caravan trading routes connecting India, Persia, Constantinople and Alexandria, Baghdad was in an unrivaled commercial position. Profiting by the peace and protection of Islam,

merchants traveled safely between India and Egypt, paying tribute to the commercial overlordship of Baghdad. The city grew rapidly. A new and wealthy class of merchants, some of whom attained huge fortunes, came into existence, favored by the caliphs as well as by the Koran. Their prosperity soon seeped down to even the humblest citizens.

Scientific agriculture was vigorously fostered by the caliphs. The ancient irrigation system which had once made Mesopotamia the bread-basket of the world was renovated and enlarged until the environs of Baghdad became a fertile land of gardens so fruitful that they evoked the admiration of all visitors.

A crude but practical justice, which later developed into the Islamic law, was set up and administered. The "cadi", or judge, was available to the lowliest citizen, as in fact even the caliph was at times. A new taxation system, more equitable than that under Roman rule, helped to stabilize the economy. A general exuberance and atmosphere of adventure pervaded the life of Baghdad. Something of the spirit of these heady times has been captured and preserved in 'Arabian Nights', which portrays vividly, albeit naively, life in Baghdad under the rule of Harun al-Rashid.

This fabulous ruler, whose reign was of great material brilliancy, was succeeded by his son al-Mamun, during whose twenty years of rule from 813 to 833 A.D. began the scientific activity which resulted in important contributions to world civilization.

We must here consider the geographical and racial situation prevailing in and around Baghdad which favored the rise there of culture and science. For centuries prior to its conquest by the Arabs, the territory had intermittently been part of the Neo-Persian Empire under the rule of the Sassanian Dynasty, whose last representative, Yazdegard III, had been conquered by the Arabs and was now dying in exile.

Chosroes, Yazdegard's grandfather, had been an admirer of the Graeco-Roman culture, long neglected under the Neo-Iranianism of the Sassanians. Throughout his reign he had attempted to revive and re-introduce this culture to Persia, offering hospitality to the philosophers turned out of Athens when the Emperor Justinian closed its school. In Jundishapur, not far from the new city of Baghdad, a medical center of sorts had been established. Chosroes expanded it and welcomed to it Greek exiles from Athens and Alexandria, and Nestorian Christians from Syria.

Chosroes was ambitious and he knew history. It became his dream to establish at Jundishapur a center of learning like that in Alexandria. Copying the Alexandrian curriculum, he introduced the texts of Galen, greatest of Greek physicians. As the medical center grew a hospital was built to serve it. Soon Jundishapur had a faculty of astronomy and an observatory; and instruction in mathematics was introduced.

With its cluster of educational and medical facilities, Jundishapur grew to be second only to the Museum of Alexandria. Here the Greek language was abandoned

and instruction was given in Syriac. Greek classic texts were translated into that language. Scholars of various races and religions gravitated to this cultural center until Jundishapur became the world's greatest clearing house of philosophic and scientific thought. Greek, Jewish, Christian, Syrian, Hindu and Persian ideas were constantly compared and exchanged in its cosmopolitan environment.

Thus was the stage set in Persia for the flowering of Islamic culture.

4

It was this Persian influence which kindled in the Arabs, newly arrived at the outposts of civilization, interest and zeal in the acquisition of knowledge. Persian scholars in the court of Harun al-Rashid had already established cultural affiliations between Baghdad and Jundishapur by the time Mamun mounted the throne in 813 A.D., one of the dramatic moments of civilization.

Mamun himself was not pure Arab, his mother having been a Persian. His wife was also Persian and he inherited the services of a Persian Prime Minister. Mamun was hardly a model of Islamic piety; in fact, his opponents called him the "Prince of Unbelievers." He was a ruler molded for the very purpose of yielding his imagination, intellect and heart to the collective learning of ancient Persia and pagan Greece to which he was heir.

A century and a half of caliphs had come and gone since the death of Muhammad, yet none until Harun and Mamun had taken any interest in the Greek learning; scholarship, such as it was in the Islamic world, being dedicated to theology, jurisprudence and the practical arts of geography and desert navigation.

Mamun invited to his court scholars from all parts of Eastern Asia. Persians, Greeks and Armenians jostled elbows with Arabs. Christians and Jews were as welcome as Muslims. These scholars were kept busy translating and codifying works of science from the Greek and Aramaic languages. Their emoluments were generous and their prestige great.

Now a zealous patron of education, Mamun dispatched agents to search Out and bring back to Baghdad Greek manuscripts from all parts of Syria, and even from distant Byzantium and Armenia. The treasures of Greek learning that had strangely lapsed under the theologically obsessed and scientifically sterile culture of Byzantium were now translated into Arabic, the universal language of the Islamic Empire.

It was not an easy task to translate Greek science into the somewhat primitive idiom of the Arabs which had formerly lent itself chiefly to poetry and oratory. A whole new terminology, adequate to convey the ideas of science, had to be created. Thus forced to become a vehicle of both scientific and religious thought, the Arab language achieved a power of expression considerably greater and more subtly diversified than any other existing tongue.

5

Baghdad was now the focal center of the world's learning. Scholars flocked to

it from all parts of the Islamic empire. For here was to be found the greatest existing area of opportunity and reward. Every past civilization-Greek, Persian, Hindu, and Egyptian-made its contribution to the rapidly growing universal culture of Islam. It was a period of great exaltation, similar to that which later, partly through Islamic influence, was to inspire Europe and to be known as the Renaissance. It was a period of discovery, of progress, of rapid assimilation of all the science and technology of the past and present. Even distant China made, via Samarkand, a contribution which has been a basic factor in all the world's subsequent learning and culture-the art of manufacturing paper.

In order better to coordinate the work of his translators Mamun founded what many students of history consider to be the world's first modern university, his famous "House of Wisdom." This institution combined the functions of a library, an academy and a translation bureau. Soon other leading Islamic cities such as Cairo, Fez, Samarkand and Cordora were engaged in similar activity.

Mamun also erected observatories. And his mathematicians correctly estimated the circumference of the globe as 25,000 miles. About 200 B.C. the Greeks had conjectured that the earth was round, but it remained for the Arabs to give scientific exactness to this concept.

6

The Arabs showed a practical bent in their resurrection and expansion of the world's forgotten or neglected sciences. Mamun was a perfect example of this practicability. His zeal for abstract learning did not lessen his concern for the welfare of the humble peasant, the "man with the hoe", upon whose shoulders has always rested fundamentally the burden of civilization. For he fully realized the importance of the soil and its tillage both as a source of state income and as a means of prosperity and happiness to the masses.

Farms which had been abandoned during the turbulent period of warfare between Persia and Rome were gradually restored, and ruined villages were rebuilt. With the reorganization of the irrigation system the fertile Tigris-Euphrates valley was made to produce an abundance of dates, apricots, peaches, plums, figs, grapes, olives and almonds. The staple diet of wheat and rice was increased to meet all needs. Sugar-cane plantations with adjoining refineries were established. Eggplants were grown; also radishes, cucumbers and beans. Most delicious of all, the cultivation of the orange was introduced about this time, probably derived from Persia.

Scientific horticulture became a flourishing and progressive practice in all the Muslim caliphates. The whole known world was scoured for new varieties of plants, and the art of irrigation was intelligently utilized to increase production. Flowers were cultivated by the smallest householder; and the caliphs and courtiers had magnificent fountained gardens in which to while away their leisure hours.

Prosperity and culture were not peculiar to the wealthy class alone. For this

rapidly growing Islamic civilization was built upon the broad foundations of the welfare of the common people, in accordance with the precepts of the Islamic brotherhood founded by Muhammad, upheld by the Koran, and practiced by all the early caliphs.

Probably never in previous centuries had the well-being of the masses been so deeply and intelligently considered as it was in all these Islamic caliphates. The new socio-economic pattern in religious and political life gave a dynamic unity to all phases of Muslim activity. The extraordinary rise of the Arabic-Islamic culture cannot be viewed separately from this factor of unity which, beginning on the spiritual plane, reached down to dominate all aspects of secular life.

The Koran had praised generosity as one of the greatest spiritual attributes and alms-giving was one of the five practices required of all Muslims. The ruling class and the wealthy merchants often distributed a large portion of their wealth among the common people.
Fortunately for the peasant class, the Arabs who became wealthy through trade had little inclination to acquire large landholdings. Fortunes were easily made, and to become prosperous it was not necessary to oppress the hardworking peasant, who was left in inviolate possession of his own little plot of land embodying the ideal of Israel that every man should "sit under his own fig tree."

All of these factors combined to create a seemingly more harmonious and universally prosperous economic pattern than had existed before the coming of Islam. A proof of the satisfactory condition of the masses during the first few centuries of Islamic rule is that practically all of the Middle East and Persia, ninety percent of the population of Christian Egypt, and all the peoples of North Africa became Muslims. This they did of their own choice, for conversion was never forced upon the conquered.

7

The example of Mamun in encouraging the cultural progress of Baghdad was later followed by the caliphs of Cairo, Fez, and Cordova; also by rulers in Persia and in distant Bokhara and Samarkand.

In all these Islamic centers libraries and universities were founded, and schools for the common people were established. Learning and scholarship were highly honored. The new common language enabled scholars to move from court to court in search of career opportunities. Thus a constant exchange of ideas stimulated the focal centers of Muslim culture; scientific advances and discoveries were quickly spread from caliphate to caliphate.

Among the sciences which the Arabs resurrected from Greek learning was astronomy, to which they added full as much as they received. Plane geometry they picked up from the Greeks also, adding to it analytical geometry. The science of trigonometry, both plane and spherical, was largely founded by the Arabs. And algebra indicates by its derivation its great

indebtedness to the Arabic scholarship. Their greatest creative contribution to the science of mathematics, however, was the decimal system, which they derived from India and greatly expanded.

From Chinese origins the Arabs devised the compass, with the aid of which they not only traversed the Mediterranean but even ventured far out into the Atlantic. Also from China they derived and augmented an invention which has literally shaken the world, gunpowder. The Chinese had used it in more or less unconfined flares to honor their dead. But an Arab inventor is said to have conceived the idea of confining this material -- the explosive quality of which had been improved upon by Muslim science -- in a sort of improvised cannon which was the forerunner of modern artillery.

The science of chemistry was developed by the Arabs from the ancient practice of alchemy. Broadening their research far beyond the unpracticable endeavor to turn baser metals into gold, these new scientists made discoveries which added both to the wealth and the health of the Muslim world.

The Arab artisans, applying this new knowledge in chemistry, became the leading metallurgists of the world. For centuries the finest swords and the finest metal decorative work of Europe came from Damascus, Baghdad and Cordova. The very word "damascene" -- meaning to adorn metal work -- carries back to the origin of this art in Muslim Damascus.

Of even more value to the world was the Arabic application of chemistry to medical science. The Muslims may justly be called the founders of medical chemistry. For not only did they make remarkable discoveries as to the curative use of drugs in the treatment of internal disease, but they founded the world's first school of pharmacy.

The art of healing, which the Arabs energetically researched from Greek, Egyptian, Persian and Hindu sources, they enhanced to such an extent that Islam maintained all through the Middle Ages an incontestable supremacy in this field. Their physicians, who were true scientists, went deep into the origin and evolution of maladies, making for the first time in history scientific clinical observation.

8

The highest tide of Islamic culture, 800 to 1100 A.D., was coincident with the lowest ebb of European culture. While the Muslims enjoyed general standards of living equal to if not surpassing those of the preceding Graeco-Roman civilization, the Europeans were living in the semi-barbarous squalor and restricted regime of feudalism -- a pattern unalleviated by comforts and luxuries.

These centuries of European history have aptly been termed the Dark Ages. The Church alone kept alive sparks of learning amidst the ashes left by the barbaric hordes of Goths. It took centuries for Latin Europe to digest this illiterate mass of barbarism and to assimilate it into a vital and intelligent organism capable of progress.

One of the strangest dramas of history is that at the very moment when Europe, prodded by contacts with the Islamic culture in Sicily and Spain and by the Crusades, began to recover from its prolonged descent toward darkness, Islam entered a decline that was to carry it down into the very fog of obscurantism from which it had helped to rescue Europe.

9

As Baghdad had been the first Islamic center to arise in a plenitude of splendor, so it was the first to fall into that decay which seems an inalienable concomitant of success. As in the case of Rome, the corruptions of luxury and the selfish grasping of power by rival political elements contributed to her decline. The justice which had characterized the rule of the early caliphs yielded to an inequitable system of taxation and to corrupt government.

That martial spirit which had so characterized the Arab conquerors had disintegrated to the point where military support was sought from foreign mercenaries. As early as 940 A.D. the Chief of the Bodyguards, a group of such mercenaries, so usurped the power of the Caliph al-Radi as to cause Arab historians to list him as the last real Caliph of Baghdad.

After a century and a half of disorganization under this new military dynasty, the Seljuk Turks, whose aid was enlisted by one of the rival claimants of the Caliphate, became the rulers of the Arabs they had been requested to deliver. The Caliphate now passed under their jurisdiction. These Seljuks, who styled themselves "Sultans", were untutored and illiterate, but they were able rulers and knew how to draw for assistance from the more cultured races they dominated. They had already adopted the religion of the Arabs. Known to Europe as the Saracens, these were the Muslims with whom the Crusaders chiefly contended; and from their number the Sultan Saladdin attained immortal fame.

In 1258 A.D. a mortal blow was struck to Islamic civilization as it was represented in Baghdad. Mongolian hordes under Hulagu captured and almost completely destroyed the splendid city of the 'Arabian Nights'. The city was engulfed in flames and the majority of its population of 200,000 perished, together with its library of over 400,000 volumes. More disastrous still to this region was the devastation and subsequent neglect of the famous irrigation system -- a neglect which turned the grain-bearing fields of the Fertile Crescent into pestilential swamps, a condition in which they have remained largely until this day.

These same Mongolian hordes, under the conqueror Ghengis Khan, had previously destroyed other great centers of Islamic culture: Bokhara, Samarkand, Balkh, Harat and other cities beyond the Oxus. The eastern area of the Islamic empire was thus completely disrupted for a time. When order and peace returned to the Middle East, it was under the rule of another branch of Turks, the Ottomans, also converted to Islam-a race able in military and political organization but lacking those essential requirements of civilization possessed by the ancient cultured races of the Middle East.

The Arab Muslims, viewing the historic decline of their progressive civilization, can lay blame on these incursions of semi-barbarous races, just as the responsibility for the fall of Rome may be attributed to the Goths.

But in each case the cause of downfall was more deep-seated and internal: a moral and spiritual decay due to too much wealth, luxury and pleasure-seeking. Sexual laxity and indulgence weakened the fibre of the ruling families of Islam. In addition to maintaining large harems, the wealthy became addicted also to homosexuality.

Another cause of the weakening of the Caliphates, not only in Baghdad but in other centers of the Islamic world, was the resurgence of that innate individualism which characterizes the Arab. The early rulers of Islam, during the period of conquest, had been strong enough to allay this separatist tendency and for a while had given sufficient unity to the far-flung Islamic empire to bring about remarkable progress in prosperity and the arts of civilization.

But now Islam was unable to control the rival ambitions of the quarrelsome progeny spawned by the numerous wives and concubines of the rulers. The very spirit of adventure and conflict that had enabled the Arabs to conquer half the known world now spurred them into conflict among themselves.

The vastness of their territory was another factor militating against the stability of the Arab state. Their numbers were sufficient to furnish only a skeleton bureaucracy of administrators. The native inhabitants were in an immense majority. If they had not been welded by conversion into the unity of Islam, they would have soon flung off the Arab yoke as Persia actually did, language and all, in a few centuries.

Despite the great decline of Islamic civilization and the backward condition of most of the Muslim countries, Islam is still a vital force in the world, and enlightened Muslims are working earnestly to restore it to its early purity and simplicity. Islam "per se" was never antipathetic to science and progress, they assert. The Koran, the Hadiz, and history itself prove this. How to recapture Islam's dazzling past: this is the fervid question that confronts pious Muslims today!

IV

New Heights in Spain

WHILE the Caliphate of Baghdad was declining, a caliphate at the other end of the Mediterranean was rising toward its zenith. Islamic civilization was destined to reach its height, not in Asia or Africa, but in European Spain. Bordering so closely upon Africa, Spain lent itself easily to invasion, especially when the invaders were actually encouraged by malcontents, as indeed was the case. A rebellious group of Visigothic nobles finally sought the aid of Musa, conqueror and governor of North Africa who had succeeded in amalgamating

the mixed population of that area with the Arabs under the name of Moors.

Musa, learning by careful reconnaissance that Spain lay ready for conquest, dispatched his subordinate, Tarik, with a force of 7,000 men, mostly Berbers. Landing in Spain in 711 A.D. at a point near Gibraltar, Tarik, reinforced by 5,000 additional Berbers, advanced to meet in battle Roderick, King of the Visigoths. The Visigoths were routed and the conquest of the rest of Spain was swift and easy; for the country was torn by religious disputes between Arians and Athanasians, Jews and Christians, and by jealous rivalry for power among Gothic nobles.

Musa, jealous of Tarik's success, led to Spain a force of some 10,000 troops, all Arabs, and completed the conquest of cities and strongholds that had been able to resist Tarik.

Leaving his son Aziz in command of Spain, Musa returned to Damascus, traveling overland through North Africa with immense booty, a great retinue of slaves and many prisoners of war including four hundred Visigoth princes. The triumphal procession was given an official reception by the Caliph al-Walid as a mark of the importance of this greatest of Islamic victories.

The Arab armies endeavored to penetrate still further into Europe. Passing through the country of the Basques in northwest Spain, they invaded Gaul. But here, in the historic Battle of Tours in 732 A.D., Charles Martel inflicted a decisive defeat upon the Muslims -- a defeat which saved the main continent of Europe for Christendom.

2

After the retirement of the powerful Musa from Spanish affairs, the country endured vicissitudes and factional rivalries until Abd al-Rahman, sole remnant of the Omayids, became ruler of Spain and founder of the Omayid Caliphate of Cordova. This new caliphate became a segment of the Islamic Empire separate from the central Caliphate of Baghdad, though it enjoyed harmonious cultural and commercial relations with its Eastern counterpart.

Abd al-Rahman proved to be one of the best sovereigns Islamic Spain was to know. Just and generous, scrupulously honorable in all his dealings, he was careful to appoint subordinates who were similarly virtuous. Rahman interpreted the Islamic law in such a way as to secure order and prosperity in his new kingdom. He encouraged commerce, and had dock-yards established all along the Spanish coast. Soon the merchant class, which was already powerful in Spain, was achieving wealth by sea-borne trade with every quarter of the known world.

The new ruler adorned his capital with lovely gardens and magnificent architecture. In Cordova he caused to be built one of the most superb mosques in the world -- an edifice which still stands as testimony to the skill of Islamic architects.

Himself a pious Muslim, Rahman promoted religion, founded schools and encouraged literature. During his long reign of thirty-two years he laid solid

foundations for the prosperity and happiness of Moorish Spain.

3

The Arabs found in Spain a versatile and enterprising population of exceedingly mixed character out of which to shape their unique civilization. Interspersed with the native Iberians had been for over a thousand years enclaves of Phoenicians, Greeks and Carthaginians, all of whom excelled in trade and who had built and maintained flourishing cities. The Romans had conquered this heterogenious population, settled among them and introduced them to their civilization. Under Roman rule Spain developed into the leading adjunct to Italy. Aqueducts and roads were built, harbors were improved and agriculture prospered. Town life everywhere was Roman, at that period the world's acme of comfort and splendor. And when in the Fifth Century the Visigoths invaded and conquered Spain they were less destructive than the barbarians who had successively invaded Italy.

The Arabs, therefore, found themselves possessors of a stable and fairly prosperous country; and falling heir to the wealth and culture of ancient Rome they wisely refrained from pillage and destruction. Upon Roman foundations they built a progressive and equitable civilization.
The inhabitants of Spain had for centuries been characterized by enterprise, energy and spirit. To this potent mixture the Arabs added ingredients of even greater daring and adventure.
Following the conquest of Spain, Arabs migrated there in large numbers from Africa and Arabia bringing with them wives, families and property and many of the luxuries of the Islamic East hitherto unknown to Europe.

The Arab conquerors claimed for themselves the best properties but secured to the peasant population its minor holdings. Arabic became the new and universal language of Spain and the Muslims introduced to the peninsula the progressive customs and manners of the Eastern Caliphate, so that this European country soon became as thoroughly Arab as North Africa and Baghdad.

Many Christians among the conquered population adopted the religion of the rulers. To some of the Arian sect indeed, the monotheism of Islam was a welcome relief. For they had endured persecutions under the prevailing Athanasians -- who swore, lived and died as devout Trinitarians. However, those who wished to remain Christians were permitted to do so. Their property and lives were not threatened. And for the first few centuries of Islamic rule their lot was better than it had ever been.

Great tolerance was shown also to the Jews, of whom there were a large number. Never in fact since the downfall of Jerusalem had the Jews enjoyed such security as they did now under the Caliphate of Cordova.

4

The victory of the Arabs was far from a disaster for Spain. It brought greater equity and opportunity to the common people. Those peasants who had been serfs under the feudalism of the Visigoths became free landholders and their taxes

were reduced to one-tenth instead of one-third. In fact the heavy weight of feudalism -- which was to hold the rest of Europe in the deadening inertia of the Dark Ages -- was abolished in Islamic Spain, a significant factor in its agricultural prosperity.

Important too to the economic progress of Spain was the introduction there of the system of irrigation which had previously turned barren districts of Syria and North Africa into productive areas. Spain had an abundance of mountain-fed streams upon which to base an irrigation system that soon stood unequalled in the world.

The Arabs also brought to Spain all those agricultural developments which had been successful in Persia and Syria. The cultivation of rice, sugar and cotton was introduced. The orange, unknown to the Mediterranean world, was received enthusiastically and along with the peach and other small fruits helped to enrich the meager diet of Visigothic Spain.

The manufacture of fabrics -- silk, cotton, woolen and linen -- soon employed thousands of people and brought great wealth to the merchant class. Metallurgy flourished until the swords and armor of Toledo held a reputation unequalled in the world. Ceramics, glazed pottery and oriental tiles embellished the homes of the Moors and gradually found their way to European markets.

Commerce developed not only between the cities of Spain but also with North Africa, Syria and Persia. The Moors found a great advantage in being part of the vast Islamic Empire, united with distant lands by religion and language. This stimulus revived the ancient commercial prowess of Spain and brought it to new heights.

5

The pinnacle of progress in Moorish Spain was reached under the rules of Rahman III and his successor Hakem II -- two gifted caliphs who reigned from 912 to 976 A.D. This period marks the flowering of Spain to its greatest degree of prosperity, culture and happiness.

Under Rahman III -- a man distinguished by high intelligence, liberality and inflexible justice -- Spain flourished as never before. Commerce thrived and large fortunes were accumulated. The Caliph built a powerful navy, which together with other Islamic navies in the East, protected trade and turned the Mediterranean into a virtual Muslim monopoly.

Science and art were encouraged everywhere in Islamic Spain, by caliph and courtier alike. Artists, poets, philosophers and scientists were amply rewarded by their wealthy patrons. Public libraries were founded in all the large cities of Spain, and academies for the advancement of science and literature. The science of medicine, little known outside the Islamic world, advanced so far in Cordova that Christian princes came to the court of the Caliph to be cured of their diseases.

Before he died in 961 A.D. the fame of Rahman III was so widespread that

embassies from Europe and even from Constantinople came to visit him.

Even more glorious than the reign of Rahman III was that of Hakem II who succeeded him. Rarely does a kingdom have two such enlightened rulers in succession. Hakem disliked war and devoted all his energies to the arts of peace and progress. He had an intense fondness for literature and sent agents throughout the world to Islam -- even to furthermost Bokhara -- to secure scarce manuscripts. And to distinguished authors he personally wrote to request copies of their works for which he paid handsomely. Books which he could not thus purchase he caused to be transcribed. At one time his library contained more than four hundred thousand manuscripts, all of which the Caliph had personally examined and catalogued.

Hakem II attached a number of scholars and creators of literature to his court. He took a deep interest in education, establishing twenty-seven new public schools in his capital and enlarging the scope and reputation of the University of Cordova.

6

Throughout the Islamic Empire education, art and science were unified by a common faith, a common language and common customs. Muslim scholars could travel freely between Bokhara north of India, and Cordova. The extent of this Islamic civilization, as well as the progress and achievements of its component parts proved an inspiration to Muslim scholarship and creative arts.

The University of Cordova, for instance, drew teachers and students not only from Spain but also from Iran, Syria, Egypt and North Africa. Thousands of pupils filled its halls when favorite professors lectured. Some of these students attended from pure love of learning; but most of them for the sake of professional advancement in the Muslim bureaucracy. They prepared for posts in theology, jurisprudence or civil service.

This devotion of Hakem II to the arts of peace made Cordova the most brilliant center of intellectual life not only of Islam but of the whole world.

"All this intellectual activity was not the artificial creation of an autocratic monarch," says Dr. Henry Schurtz in Helmolt's History of the World. "It was the healthy and brilliant bloom of well-nurtured material prosperity. In truth, the inhabitants of Christian Europe, living as they did in gloomy city alleys or miserable village hovels clustered around the castles of rude uncultured nobility, would have thought themselves in fairy-land, could they have been transported to this joyous brilliant world. And in witnessing the noble spirit of toleration and of intellectual freedom which breathed over the happy plains of Andalusia, they would have been forced to admit that their own religion of love might learn something in the way of generous fellowship of faiths from the hated Muslims.

"Herein lies the fascination which today impels us to look back with yearning and regret upon the too rapid flight of that happy period, that dreamy beauty of Andalusian civilization when Cordova and Toledo guarded the sacred fire of

civilization upon European ground -- a fascination which still throws a glamour around the halls of the Alcazar of Seville or the pinnacles of the Alhambra."

7

It is necessary at this point to make a digression, in order to consider the creation by the Muslims of a high culture in Sicily, comparable to that in Spain and an important bridge for the transference of Islamic science and learning into Christian Europe.

Sicily had been conquered by the Muslims in 902 A.D.; and it remained under Muslim rule until it was conquered by the Normans under Count Roger in a prolonged campaign culminating in 1091 A. D. Under the rule of Roger I -- who, though Christian, admired greatly the culture of the Muslims -- Sicily witnessed a remarkable coalescence of Islamic and Christian cultures. Here the legacy of Greece and Rome found a unique flowering under the Arab-Norman genius. Roger I patronized Arab learning and surrounded himself with Oriental teachers, physicians and poets. He did not destroy the previous Muslim system of administration. He even kept in high office Muslim personnel. In fact, his court at Palermo seemed more Oriental than Occidental.

Roger II of Sicily was also deeply appreciative of the Islamic culture. He dressed in the Muslim style, ornamented his chapel with Arabic inscriptions and attracted Muslim scholars to his court.

During this century the trade of the country was left largely in the hands of the Muslims. And the tolerant and enlightened rulers favored the cultivation of the land by the Arabs who had brought here, as to Spain, the most advanced methods of irrigation and horticulture.

Roger II's grandson Frederick II adopted even more than his predecessors the culture and customs of the Islamic civilization which surrounded him. He kept a harem and led a semi-Oriental life. He invited to his court scholars and philosophers from the Middle East and maintained close commercial and political relations with Syria and Egypt. The industries and arts of the Muslims spread under his rule from Sicily into Southern Italy which had become part of the Norman Kingdom. The manufacturing of Arabic textiles was taught the Italians by Muslim workers; and "so great was the demand for Oriental fabrics that there was a time when no European could have felt really well-dressed unless he possessed at least one such garment."

More important still was the educational and scientific legacy which flowed from Sicily into Europe. Through the influence of the Muslim University of Salerno medical schools were founded in Europe. It was especially in Sicily under the tolerant reign of the Normans that Arabic and Greek works of science were translated into Latin and thus introduced into medieval Europe.

Hitti, in his 'History of the Arabs', sums up this influence of Islamic culture on Italy as follows: "This almost modern spirit of investigation, experimentation and research which characterized the court of Frederick marks the beginning of the Italian Renaissance. Italian poetry, letters and music

began to blossom under Provencal and Arabic influence. On the whole, Sicily as a transmitter of Muslim culture might claim for itself a place next in importance to Spain and higher than that of Syria in the period of the Crusades."

8

These halcyon periods of humanity such as the Moorish epoch in Spain do not last. Why and how did this prosperous, progressive and dynamic civilization of the Moors come to an end? Its doom was sealed, it seems, long before the Christian warriors of North Spain gathered enough strength and zeal to win back Spain to Christendom. It is a story of the same moral and political decadence that had ruined Baghdad. The rulers -- victims of luxurious sensuality and sex -- became so effete that anarchy frequently prevailed.

Of one of these rulers, al-Mustakfi, it was stated by a later Arab historian that his "interest in life centered in sex and stomach." The praetorian guard, composed of Berbers and Slavs, took advantage of this weakness to make themselves the virtual rulers of Muslim Spain.

At the end of a succession of weak caliphs the people of Cordova in 1027 A. D. abolished the Omayid Caliphate. This act gave rise to a score of small states ruled by so-called kings, the most important of which was Seville. Here, under al-Mutadid, Islamic culture began to thrive again until the pressure from the Christian King Alphonso II of Leon and Castile (to which Navarre had recently been added) compelled al-Mutadid to the fatal step of inviting to his aid against these warring Christians a Berber Chief, Yusuf, leader of a powerful Islamic military brotherhood in Morocco.

Yusuf responded with alacrity. Bringing an army of some 20,000 men he inflicted a humiliating defeat on the Christians. Alphonso's army was annihilated and Alphonso barely escaped with his life.

This victory over the Christians postponed for over two centuries the fall of Islamic civilization in Spain. But it was a Pyrrhic victory for al-Mutadid. For Yusuf, admiring the luxurious life of Spain, returned the following year to the peninsula and conquered not only Seville but also Granada -- subsequently annexing almost all of Muslim Spain.

9

And now began a fatal decline of the great Moorish civilization. For the newly arrived Berbers were a semi-barbarous race and their Islamic zeal was of a fundamentalist nature destructive to the progress of science and philosophic thought. Just as the scientific progress and high civilization of Baghdad had been vitiated by Turkish rule long before it fell a prey to the invading Mongols, so the Moorish culture of Spain went into an eclipse under the rule of the Berbers.

Moreover, that part of the native population which had remained Christian and had thrived under the enlightened rule of the Caliphs of Cordova was now

restricted and in petty ways persecuted by the fanatical Berbers, to such an extent as to cause them to become disaffected subjects of Islam. Thus there existed throughout southern Spain a fifth column which was to prove of great advantage to the Christians in their subsequent attacks upon the Moorish cities.

In 1212 a powerful and zealous joint military force of Christians, brought together by a zeal which was the by-product of the Crusades, met the Moorish forces near Cordova in a decisive battle. The Christian army, under Alphonso VIII of Castile, won an overwhelming and annihilating victory over the reputed 600,000 Moorish soldiers, of whom few escaped. This event, more than the subsequent fall of Granada in 1492, marks the beginning of the end of Muslim Spain.

At the time of their reconquest of Spain, the Spanish Christians were a somewhat barbarous people, having become so during their forced exile in the mountains of Austrurias. It must be remembered that previous to the incursion of the Moors, they had been established in Spain -- to which they had come as uncivilized Visigoths -- only a couple of centuries; and what little of culture they had acquired during this brief period tended to evaporate in their primitive mountain life. Deprived of their former cultural and economic resources, they had quickly degenerated and lost the scanty civilization they had attained while living under the Romanized culture of Spain. In this desperate condition they had abandoned the habit of washing either their clothes or their bodies.

It was this illiterate group who in 1212 A. D. returned to Spain and found themselves again in happy occupation of the sunny, fertile plains of Andalusia. How they gradually absorbed the technological and aesthetic culture of the Moors during the ensuing centuries is described in the following chapter.

V

How Islamic Culture Was Communicated to the Spaniards

HOW was it that the splendid Moorish civilization of Spain had declined to the point where it invited defeat at the hands of the hardy Christian warriors of the North, who for centuries had followed little other profession than fighting? The same factors that had diminished Islamic power in Baghdad were operative in Muslim Spain.

Let us review these factors, already discussed in the previous chapter:- the individualistic quality of the Arab and his incapacity for large loyalties except to the Koran and Allah; the undermining of the character and energy of the rulers by a harem system which not only permitted but encouraged extreme sensuality; the enervating effect of the softly pleasing climate of Andalusia, the very charms of which were dangerous to the maintenance of moral and energetic character; and the growing discontent of the Christians, a large element of the population whose inferior position as second-class citizens of the caliphate, combined with increasingly oppressive taxation, deprived them

little by little of any loyalties they may previously have had to their Muslim rulers.

In the titanic contest at Las Navas de Tolosa near Cordova in 1212 A. D., as previously mentioned, the Muslims were utterly defeated by Alphonso of Castile, who led a zealous Christian army composed of forces from Aragon, Navarre, Portugal, and France. Only one thousand out of hundreds of thousands of the Moors escaped. Though this battle clearly marked the end of Muslim political dominance in Spain, Moorish influence continued to be felt in other areas of Spanish life for almost three centuries.

Why did not Alphonso make a clean sweep of it and drive the Moors completely out of Spain? Probably because he was better prepared for military victory than for rule. What he actually did was to parcel Spain out to various petty Christian rulers and to local Muslim dynasties, many of which preserved and even enhanced the civilization of Islam.

Strangely enough, it was during the period of Islamic political downfall that Islamic culture exerted its greatest and most benign influence upon Spanish, and subsequently upon all European civilization. For once the Spanish conquerors had satisfied their burning desire to reconquer Spain from the infidels, they apparently lost much of their fanatical hostility toward the Muslims and learned to live side by side, and to an extraordinary degree share with the Moors the daily life of toil and productiveness.

The reason for this friendship was a practical one. The Christians desperately needed these conquered Muslims in order to learn from them those arts of living which had been evolved over the centuries. The Moors were possessed of a technology that could be transmitted to the crude Spanish conquerors only by personal tuition over a prolonged period of time.

The Christians needed the Moors to teach them the cultivation of the silk worm, and the weaving of silk and other textiles. They needed from them instruction in the ceramic arts and in the technology of metallurgy. They needed Moorish carpenters and masons to instruct them in
the art of building. They needed all that the Moorish agriculturist could teach them about irrigation, horticulture and stirpiculture.

Hence Moors and Christians continued to live peacefully together for over two and a half centuries, a period pregnant with progress for the Spanish. Such friendly contact between Christian and Muslim had never existed before, and has never existed since. It was in many ways an idyllic period, an episode in the story of humanity that deserves fuller treatment from historians and romantic writers.

2

The Moorish kingdom of Granada remained for almost three hundred years the center of Islamic culture in Spain. Its climate was excellent and its environs fertile. Abundant streams furnished water for irrigation and for baths and fountains. The air itself was laden with perfume.

Here for a time the rulers revived the glory of the previous Cordovan caliphate. By encouraging commerce they made Granada the most prosperous city of Spain. On a hill bordering this beautiful city al-Ghalib built a splendid palace, superb with decorations and arabesque moldings. Later known as the Alhambra, it is still a shrine for admiring travelers.

The rulers' patronage of art and learning attracted numerous scholars to the court. Many Jews had previously settled there -- a minority race that was favored because of its great contributions to the science and art of medicine. Muslim refugees from parts of Spain under Christian rule also flocked to Granada, until its population reached half a million.

In all the leading cities of Spain lived now a composite group of citizens made up of: (1) the Christian conquerors from the north of Spain; (2) Christians of Andalusia who had remained Christian, but who lived and dressed like the Muslims and spoke and read Arabic; (3) Muslims descended from previous Christian families who now reverted to the religion of their forebears and became Christians; (4) similar Muslims of Christian antecedents who remained Muslim; (5) the Moors, largely Berber though with some traces of Arab blood, who were steadfast and zealous Muslims; and (6) Jews, who had played a prominent part in the progress of Islamic civilization in Spain.

What a hodge-podge of races and religions! It was a rich admixture and one well suited for progress. The Christian ruling class, coming from the dark castles and crude surroundings of the barren north country, adopted willingly the greater graciousness of Muslim life -- much as the Mongol conquerors of China gradually took on the amenities of Chinese living. Almost a coalescence took place. An urban refinement was imparted to the lives of the Castilians by the cultural influence of the Moors.

3

It was this intimate association between Christians and Muslims, in Spain and also in Sicily, which imparted to Europe the awareness and the implements of a civilization which she was to borrow, just as the Muslims half a millennium earlier had borrowed and expanded the culture of the ancient classic world.

"From the ninth to the eleventh century the only civilization of the West had been Islamic," says Salvador de Madariaga, liberal Spanish historian and philosopher now living in exile. "Christendom was in the dark, while Islam shone in Baghdad and Cordova with all the lights of science, art, politics, culture and refinement. During this period Christian northern Spain was divided up into petty barbarian kingdoms on whom the mighty and refined Caliph of Cordova looked down very much as the French much later were to look down on the Moroccan tribes who were the decadent descendents of the Moors.

"Islamic Spain gave the world her philosophers, astronomers, mathematicians, mystics, poets and historians. In one of the smallest courts of Andalusia there were five thousand looms weaving all kinds of cloth from brocade and silk to wool and cotton; and the Prime Minister of another small state had 400,000

books in his library -- at a period in which the most famous of the Christian libraries in Spain, in the Repoll Monastery, boasted of its paltry 192 volumes." *

* Salvador de Madriaga - Spain, A Modern History

The influence of Moorish culture was not confined to Spain. Many Christians from other countries visited the hospitals and universities of Moorish Spain to study and take home with them greater knowledge of medicine, of astronomy and of mathematics -- fields of science in which fortunately difference of religion interposed no barriers. Among these visitors to Spain were two famous monks, Gregory of Cremona and Abelard of Bath.

More important still, when Cordova, Toledo and Seville were conquered one by one by the Christians, many of the Jewish physicians attached to Moorish universities of those cities migrated to Italy and southern France where they contributed greatly to the development of medical schools at newly founded Christian universities.

As for the Spanish conquerors, they had full need of all that these Moorish hospitals and universities had to offer. The spread of books, made easier through the invention of paper, brought a wave of fresh learning.

Books, indeed, were the most important factor in the influence of Islamic culture upon the uncultured Christian world of Spain and of Europe. Muslim Spain had collected in its libraries the literary and scientific wealth of the ages. Now began a period in which, by means of translation from Arabic into Latin, this treasury of human knowledge and philosophy was disseminated from Spain to Italy and France, thus planting the seeds of modern European civilization, as will be fully described in a subsequent chapter.

4

The life of the common people in Spain was deeply affected by the skill and habits of the Moors, and Moorish culture has left an indelible imprint on Spanish life to this day. Indeed, Moorish blood itself still flows generously in the veins of the Spanish people.

Moorish culture is discernible even today in the music of the Spanish people. The feeling, the tempo and the lilt of Spanish music is more akin to Arabic than to European music; and the guitar, that most "Spanish" of all instruments, was an Arab invention.

"As the Christian population accepted the lyric models of the Muslims, Arab songs grew more popular throughout the peninsula. Muslim musicians flourished at the courts of the kings of Castile and Aragon. Long after the fall of Granada, Moorish dancers and singers continued to entertain the natives of Spain and Portugal. The recent researches of Ribera tend to show that the popular music of Spain, in fact, of all southwestern Europe, in and after the thirteenth century, like the lyric and historical romance of that region, is to be traced to Andalusian and thence through Arabic, to Persian, Byzantine and

Greek sources." *

It was a blissful time for the Spanish people. Relieved from the stress of constant warfare, they could relax and bask in the sunny culture of the Moors, and imbibe their art and learning. The Moorish culture was a happy one; and all of Andalusia, both Muslim and Christian, shared for a time this easeful joy of living.

* Hitti -- History of the Arabs -- Macmillan

This period, too, marks the highest point reached by Jewish culture subsequent to the dispersal from Israel. Spanish history of this era reveals rich contributions of Jewish religious thought, philosophy, poetry and science. The Jews were prosperous, honored and happy, and the fame of their achievements spread through all the capitals of Europe.

5

It was nothing palpable, no serious friction among the various peoples of this Christian-Jewish-Muslim Spain that put an end to this happy epoch. The disaster that befell Spain was chiefly ideological in its nature.

When in 1469 A.D. Ferdinand of Aragon married Isabella of Castile, their union struck the death-knell of Muslim power in Spain. The local rulers were no match for this newly evolved Christian power, who conquered Granada in 1492 and so established their powerful rule throughout Spain.

These intrepid conquerors under Ferdinand and Isabella were fired by a religious zeal as great as that which had inspired the Arabs; an adventurous spirit which eventually led them to conquer and colonize South America and to found there a great Hispanic culture.

But while they were culturally fruitful in the New World, they proceeded to destroy the remains of the great Islamic culture in Spain. Moreover, they founded that dread engine of fanaticism, the Inquisition. Forced conversion of the Muslims was inaugurated. Arabic books were withdrawn from circulation, and Arabic manuscripts were burned in huge bonfires.

In 1556 A.D. Philip II promulgated a strict law forbidding Muslims to practice their worship, language or habits of life. The public baths -- so plentiful in Spanish cities because of the abundant water supply from neighboring mountains and so beloved by Muslims and Christians alike -- were destroyed. Henceforth any citizen of Spain overfond of bathing was suspect of heresy and liable to Inquisitional investigations!

In 1609 A.D. Philip III signed a final order of expulsion, and practically all the Muslims then remaining on Spanish soil were forcibly deported. Some three million Moors had been executed, exiled or deported since the fall of Granada in 1492. How different this policy was from that of Alphonso XII of Castile, who in the thirteenth century had been a kindly and sympathetic patron of Moorish scholars and artists!

The final expulsion of the Moors in the name of Christianity was a racial tragedy. When the prime minister Lerma, at the instigation of the Church, announced to the king that the exile of the Moriscos had become necessary, Philip replied, "The resolution is a great one. Let it be executed."

"And executed it was," says Buckle in his History of Civilization, "with unflinching barbarity. About one million of the most industrious inhabitants of Spain were hunted out like wild beasts because the sincerity of their forced conversion to Christianity was doubted. Many were slain as they approached the coast. Others were beaten and plundered, and the majority were in most wretched flight. During the passage the crew in many of the ships rose upon them butchering the men, ravishing the women and throwing the children into the sea."

In addition to the Moors, all the Jews of Spain were shortly expelled -- a dispersal almost as tragic as that from Palestine centuries before. For the second time in history the wide world was thrown open to the "Wandering Jew."

Islamic civilization never recovered from this fatal blow. Morocco, to which the exiles fled, did not provide a favorable environment for the culture which had flourished in Moorish Spain. The Moors in Morocco turned to piracy and harassed for several centuries Europe's trade in the Mediterranean.

If this obliteration of Islamic culture was a disaster to Islam, it was also a disaster to Spain. Agriculture suffered from the loss of Moorish skill and enterprise. The irrigation system fell into disrepair, transforming one of the garden spots of the world into a semi-arid and half-sterile country. The arts of living languished. And the gaiety, insouciance, and "joie de vivre" which had characterized Moorish life were lost in the sombre shadow of the Inquisition.

The mines which had always been a source of wealth to Spain were either abandoned or inefficiently worked. The weaving of textiles declined markedly. In Seville, one of Spain's richest cities, the number of looms fell from 16,000 at the peak to 300. Toledo lost almost all of its woolen manufactury; and also its manufacture of silk which had employed 40,000 persons. The making of gloves, for which Spain had been famous, came to a stop. Trade halted. Sea-borne commerce and fisheries declined, because the Spanish were not sufficiently versed in navigation.

In fact, the dislocation of the Spanish economy by the expulsion of the Moors and Jews was so severe that want and starvation reigned in many places.

"The Moors were banished," says Lane-Poole, in his 'Moors in Spain', "and for a little while Spain still shone with her borrowed light. Then came the eclipse, and in that darkness Spain has grovelled ever since.

VI

Summary of Arabic-Islamic Contributions

VIEWING the Arabic-Islamic epoch in retrospect, one is inclined to marvel at

both the momentum and the magnitude of scientific activity during that period -- "unparalleled in the history of the world", according to George Sarton.

"The Muslim empire was created with the willing collaboration of Greeks, Persians, Copts . . . Christians, Magians, Sabeans and Jews. But this assistance does not wholly explain what might be called the miracle of Arabic science, using the word miracle as a symbol of our inability to explain achievements which were almost incredible. There is nothing like it in the whole history of the world, except the Japanese assimilation of modern science and technology during the Meji era. But the Japanese had the great advantage of the marvelous tools of modernism which accelerated every educational process.

"Both of these peoples had the best of teachers -- necessity, compelling the kind of spiritual energy which overcomes insuperable difficulties. Indeed, they had not sufficient experience nor enough patience to consider difficulties and be frightened by them. They simply rushed through." *

* George Sarton-Lecture on Islam-Middle East Institute

The immenseness of the Arab contribution can best be realized by recapitulating the most significant of her activities, considering at the same time their impact on a Europe struggling upward through the barbarism of the Dark Ages.

Medical Science

Probably because the science of medicine is so important to human welfare, its advancement has been continuous from ancient times to the present day, overcoming the barriers of race and religion which have sometimes impeded the progress of other sciences.

The Arab contribution in this area is immense. Drawing on the medical lore of the Greeks, Persians and Egyptians, the Muslim world eagerly assimilated all the available knowledge in this field. Recognizing the importance of medical science, the Arabs raised physicians to a high social rank and rewarded them with generous emoluments. The science of medicine -- allied in the Muslim as in the Hellenistic world to the study of philosophy -- flourished in every caliphate and court of the Islamic empire.

Thus stimulated, the Arab scientists made significant advances in the art of healing, especially in the use of curative drugs. The world's pharmacopoea is the richer for these discoveries. They established hospitals far and wide, and even provided medical care in some prisons. They made careful clinical observations of diseases. They did creative work in the field of optics.

The greatest contributions of Islamic medical scientists to Europe of the Middle Ages, however, were in the encyclopedic field. Al Razi, known to Europe as Rhazes (865-925)-- a Persian living near the present city of Teheran -- wrote an important encyclopedia of medicine, Al Havi, later known to Europe in Latin translation as Continens. This book sums up the knowledge of medicine possessed by the Arabs in the tenth century as gleaned from Greek, Persian and Hindu sources.

It was translated and published in Sicily in 1279 A.D. Further editions of it were printed and circulated for centuries with considerable influence in Christian Europe.

The greatest of the Muslim encyclopedists was Ibn Sina, known to Europe as Avicenna (980-1037). Avicenna, one of the world's great intellects, had an encyclopedic mind and a photographic memory. By the age of twenty-one he had read and absorbed all the books in the royal library of the Sultan of Bukhara. He then set to work to systemize the knowledge of his time.

Averroes in his Quamin (Canon) presented to the world the final codification of Graeco-Arabic medical thought. Translated into Latin by Gerard of Cremona in the twelfth century, this work became the most authoritative medical text of the Middle Ages, and was used in all the medical schools of Europe, passing through numerous editions.

"The materia medica of this Canon contains some seven hundred and sixty drugs. From the twelfth to the seventeenth centuries this work served as the chief guide to medical science in the West, and it is still in occasional use in the Muslim East. In the words of Dr. Osler, "it has remained a medical bible for a longer period than any other work." *

The medical doctrines of Galen, greatest of Greek physicians, as improved upon by the Arabs, dominated Europe through her Middle Ages. As the Renaissance brought a new awakening of the human intellect, Europe which had been stimulated by its contacts with Islamic culture, proceeded on its own energy and initiative toward those discoveries which have so greatly affected the health and longevity of man upon this planet.

* History of the Arabs, nb. cit.

Chemistry

The Arabs, upon the conquest of Alexandria in 642 A.D., fell heir to all the science of ancient Egypt as developed and reconstructed by the brilliant Hellenes of the Alexandrian period. The Egyptians had done more in the development of what is now called chemistry than any other race of ancient or classic times.

The Muslims, picking up this applied science from the Alexandrians, expanded it and handed it on to Europe under its Arabic name, 'al-chemr', known to medievalists of Europe as alchemy. Up to the Renaissance alchemy and chemistry were synonymous; and the most important discoveries in the field of chemistry were those made by the alchemist in his search for a formula which would convert baser metals into gold.

In this search for the magical creation of gold, and in their researches in materia medica, Arab chemists developed formulas for making the three chief mineral acids used by the modern world -- nitric acid, sulphuric acid and hydrochloric acid. They discovered the arts of distillation, oxidation and crystallization; also the making of alcohol.

Europe was indebted for all of its beginnings in alchemy and chemistry to the chemical science of the Arabs, which reached them through translation of Arabic works into Latin. In this science, as in other arts and sciences which they practiced, they developed an objective and experimental method as opposed to the purely speculative method of the Greeks.

The father of Arabic chemistry and its greatest genius was Jabir, known to Europe as Geber. He made significant advances in the theory and practice of his science, developing new methods for evaporation and sublimation and perfecting the process of crystallization. His works, translated into Latin, exerted a tremendous influence in Europe until the beginning of modern chemistry.

Astronomy, Geography and Navigation

The Arabs absorbed all the astronomical, geographical and navigational science and skill of the ancient world and set about formulating it into a practicable body of knowledge. Drawing heavily from Greek sources, they introduced the works of Ptolemy into the scholastic life of Europe.

Accepting the contention of Eristosthenes and other Greek geographers that the earth is round, the Arabs established correctly its circumference and measured quite accurately the length of terrestial degrees. They devised tables of latitude and longitude of places throughout the world, and worked out means of determining positions.

Navigation in the Mediterranean required only starlore. But for navigation in the Atlantic ocean something more was needed. This something more -- the compass -- was borrowed by the Arabs from the Chinese. And from the Greeks they borrowed the astrolabe -- an instrument which mapped the position of stars for navigational use.

The Arabs were expert navigators. For millenniums they had boldly traversed the Indian Ocean in quest of trade with India and with the east coast of Africa. The Mediterranean they dominated for some five centuries. And they had anticipated Columbus in venturing into the Atlantic, as far perhaps as the Azores.

It was under the tutelage of these skilled Arab navigators that Prince Henry the Navigator trained his pilots, soon claiming for Portugal the best seamen and the fastest ships in Europe.

"Portuguese pilots and navigators became the foremost masters of nautical science of their day, possessing the most exact instruments then known. It was in Portugal and on the newly won Portuguese islands of Madeira and the Azores that Columbus studied navigation. There the explorer sought information before setting out from Spain to find the seaway to India." *

* Portugal, Wharf of Europe, Elizabeth Colman, chas. Scribner & Sons, 1944

It is safe to say that without these navigational skills which the Arabs bequeathed him, and without the revival of the Greek concept of a round earth which the Arabs restored to Europe, Columbus would never have ventured forth

over the Atlantic or even have conceived the idea of such a voyage.

The Decimal System

"The introduction of Arabic-Hindu symbols for our numbers and of positional notation (the decimal system) makes it possible for today's elementary school children to perform operations beyond the capacities of learned mathematicians of Greek, Roman and medieval times," says Morris Kline in his Mathematics in Western Culture. (Oxford Press).

To the Arabs belongs credit for rescuing the useful zero from the heart of India and putting it to work in the elaboration of the decimal system, without which the achievements of modern science would be impossible.

It was Hindu philosophic genius that first conceived the idea that 'nothing', as represented by 'zero', could have any mathematical value; and further, that values of less than nothing could be indicated algebraically as negative quantities. Working on Hindu foundations, the Arabs elaborated what has become our present decimal system. They also introduced the so-called Arab numerals, adaptations of the ten Hindu digits, which gradually displaced the clumsy Greek symbols and the impossible Roman numerals.

The seven centuries beginning with 800 A.D. saw a development of computational mathematics among the Islamic peoples that surpassed all the achievements of the past. *

* About 1400 A.D. al-Kashi invented decimal fractions, a century and a half before Stevin began the use of them in Europe. He computed 2 pi to equal 6.281,185,107,179,580.5

The use of the decimal system spread gradually into Europe through the work of Leonardo of Pisa, a Christian who lived for many years in North Africa, where he picked up the Arabic system of numerals and the use of decimals. Leonardo's work, says the Oxford History of Technology, was the most important western work by a Latin Christian in which this system of numerals, then long in use by Arabic-speaking craftsmen and merchants, was expounded for technical and commercial use in the west."

It took Europe three hundred years, however, to fully accept and become adept in the use of the decimal system.

Algebra

The science of algebra owes much to gifted mathematicians of the Islamic era. Its very name proves the magnitude of this debt, for the name itself is Arabic, 'al gebr', "a binding together."

Though of Greek origin, algebra was greatly expanded by Muslim mathematicians. From about 800 to 1200 the Arabs evolved a more critical study of equations, giving them for the first time some element of scientific treatment. Algebra was then handed on to Europe via Spain and Sicily.

Paper

The introduction of paper into the Muslim and European world was made possible when Arab conquerors overran Asia and Africa in the eighth century. In 751 A.D. the Arabs in Samarkand, just north of India, were attacked by the Chinese. During the successful repulse of this attack the Arab governor came across the first piece of paper ever to find its way westward from China where it had been invented before the time of Christ.

The governor, eagerly questioning captives taken in the battle, learned that among them were men skilled in papermaking. These artisans were sent to Persia and to Egypt to give instruction in the art of manufacturing paper from flax, rags and vegetable fibres.

The unusual interest of the Arab world in the manufacture of paper was perhaps due to the fact that they were already acquainted with Egyptian papyrus, which was beginning to displace the costly use of parchment for manuscripts and books. The methods used in manufacturing paper and papyrus were somewhat similar, but paper was far superior for printing.

Paper-making was introduced into Spain in the 12th century. From Toledo, the center of paper manufacturing, it spread under the tutelage of the Moors to the Christian kingdoms of Spain. Similarly the Muslims in Sicily taught the art of paper-making to the Italians. The earliest recorded European document on paper was a deed of King Roger of Sicily dating from 1102 A.D.
Paper mills were first set up in Italy in 1276 A.D. in the town of Fabriano, and other factories soon followed in all the important cities. Thus equipped with paper, Europe was prepared for the making of books in large quantities when the invention of printing took place around 1440 A.D.

The immense importance of paper is made clear by the realization that in the Middle Ages the making of books on vellum or parchment was so expensive that only cathedrals and monasteries possessed libraries.

Gunpowder

The Arabs also learned from the Chinese how to make gunpowder, but they put it to a use the Chinese had never conceived of. They experimented with the idea that the explosive power of gunpowder could be utilized to project a missile from an enclosed chamber. It is claimed that the first effective cannon was made in Egypt sometime in the twelfth century. Made of wood bound with bands of metal, it discharged round stones. By the middle of the fifteenth century the Muslims had so improved the cannon that it was employed in the siege and capture of Constantinople.

The origin of small arms, of which the first known example was the arquebus, is shrouded in the mists of historical uncertainty. The earliest important use, historically, of the arquebus was in Cortez's conquest of Mexico, 1519-20 A.D. In Europe it was first used effectively by a corps of Spanish arquebusiers who took part in the Italian wars of 1522 A.D.

It would appear likely, then, that the small-arm originated in Spain. Some historians place its appearance as early as 1300 A.D. No connection has yet

been traced between the invention and development of the small-arm in Spain and the previous invention and development of the cannon. But if the small-arm originated in Spain during a cultural period which was Arabic-Islamic, the presumption is that it was developed logically from the Arab's previous use of gunpowder as an explosive. Moreover, the word arquebus suggests Arabic derivation.

Textiles

The clothing worn by Europeans during the Dark Ages and most of the medieval period was as crude as their diet was meagre. The Goths had graduated, it is true, from skins and furs to coarse clothing woven of wool and linen.

The Crusaders brought back glowing accounts of the rich fabrics of the East. Soon these fabrics became a part of the regular trade building up between the port cities of Italy and the cities of the Near East. Better still, the Moors of Spain and Sicily taught the Christians of those countries their skills in textiles; and taught them also how to cultivate the silkworm for the production of silk.

As a result of this Arabic influence, Renaissance Europe blossomed out in delicate and lovely fabrics of delightful textures and hues hitherto unknown to the sombre races of north Europe.

Agricultural Products

The diet of Medieval Europe was monotonous. It consisted chiefly of meats, and bread washed down with wine, beer or ale; leeks, garlic and onions; cabbage and a few root vegetables such as carrots and beets; and such fruit as was native to Europe.

The Crusaders were naturally envious of the rich and delicate tables set by the Saracens; rice prepared in many ways and served with lamb or chicken; lentils and other vegetables cooked appetizingly in olive oil; and delicious sweetmeats or fruits unknown to Europe.

The new foods gradually entered Europe via Spain and Sicily. Rice made a welcome addition to the diet. And the cultivation of small fruits -- cherries, peaches, apricots and gooseberries -- introduced to Europe by the Arabs stimulated the European appetite.

The Arabs also contributed to Christendom a cup that cheers but does not inebriate -- coffee. As alcoholic drinks were prohibited to them, the Muslims found that they could derive a comparable enchantment from imbibing coffee made with fine powdered grounds, brought to a quick boil and sipped piping hot. Those who have indulged in the East in this form of "Dolce far niente" can appreciate what coffee has meant to that Muslim world from which alcohol has been debarred for some thirteen centuries. Coffee was introduced into Vienna in the seventeenth century from Yeman, Arabia, its place of origin. Soon famous coffee-houses sprang up all over Europe. The Dutch managed to smuggle the prohibited coffee plant to Java where it was extensively cultivated; and

enterprising British made fortunes by raising it in Jamaica.

Sugar, which originated in India about the beginning of the Christian era, had proved so popular that its cultivation soon spread from India eastward into China and westward into Persia. Learning from the Persians in the tenth century, the Arabs raised it extensively in Syria, Spain and Sicily. The Egyptians, believing sugar to have medicinal qualities, invented methods of refining it chemically.

The Crusaders developed in the East a taste for sugar and introduced it to Christendom. For years Venice conducted a lively trade in sugar, trans-shipping it from Syria to Europe.

The Rise of the University

The Muslims, as we have seen, began to found universities in the ninth century, first in Baghdad and soon in Cairo, Fez, Cordova and other Muslim cities. The el-Azhar University of Cairo boasts of being the oldest existing university in the world. It was founded in the tenth century and has remained from that day the world's leading Islamic theological center.

The Universities of Cordova and Toledo were well known to Europeans, and their hospitals were frequented by Christian princes in need of medical care such as Christian Europe could not furnish.

The first medical schools of Europe were the direct result of this Moorish influence, and of great importance to the development of the scientific spirit in medieval Europe. For scientific inquiry, as it had been developed by the Greeks and Muslims, thus gained a foothold within the precincts of a Europe dominated by the Church, by theology, and by ecclesiastical culture.

The first university of Europe -- that of Salerno in Sicily -- had arisen from just such medical foundations. The origins of this university are obscure. But it is reputed to have been founded in the ninth century by a Latin, a Greek, a Jew and a Muslim. Its textbooks were translated by Constantine the African (an important figure in the history of learning) from Arabic works which were themselves partly original and partly translated from the Greeks and Hellenes.

Salerno was eclipsed by the establishment of the University of Naples in 1224 A.D. by Frederick II, who as we have seen was a proponent of the Muslim culture. Frederick had the works of Aristotle translated from Arabic into Latin, as well as the works of ibn Rushd (Averroes), the astronomer, physician, Aristotelian commentator and greatest of the Muslim philosophers.

During the early thirteenth century universities sprang up all over Europe:- Bologna, Padna, Paris and Oxford. In these universities, and in others founded later, the men of Christian Europe studied for the first time subjects that were purely secular such as astronomy, philosophy and medicine, having at their disposal texts created by the Greeks of classic and Hellenic days, and texts created by the Muslim genius.

Machinery

Machinery can be traced from its early invention by the Greeks to its current elaboration in our modern industrial age. Around the third century B.C. Archimedes discovered the principle of the lever, the pulley and the screw and demonstrated them successfully. Another Greek mechanical genius, Hero, developed the gear and the crank and -- more important -- summed up all the mechanical knowledge of his day in a three volume treatise, 'Mechanics'.

Nothing of importance was lacking for the creation of a machine age except the will to produce it. But this inclination was totally lacking in the Greeks. Slavery was prevalent and the ancient world felt no need for labor-saving devices. Furthermore, the Greek mentality was dedicated to theory and disdained the practical application of science.

When the Arabs in 641 conquered Egypt and took possession of Alexandria, they fell heir to what remained of Greek creativity. Its influence upon them grew as their own capacity evolved. They made translations of Hero's 'Mechanics' and applied its principles to two important inventions, the water-mill and the windmill.

The water-mill was an improvement over the Roman water-wheel, and was employed extensively to irrigate arid regions of Spain and North Africa. Its success there led to its adoption in medieval Europe, where it was known by the Latin name 'noria', derived from the Arabic 'naurah'.

The windmill, as far as can be ascertained, actually originated with the Muslims. The first windmill known to history was built around 640 A.D. by order of the Caliph Omar. A few centuries later an Arab geographer reported that the windmill was used widely in Persia to pump water for irrigation.

From Persia and Afghanistan the windmill spread throughout the Islamic world. It ground wheat, crushed sugar-cane and pumped water. Later it came into use in Europe by way of Morocco and Spain.

Leonardo da Vinci somehow came into possession of Hero's books and set about to improve the ancient Greek inventions. In this he was followed by other Italians, notably Ramelli. By 1600 the science of mechanics was well established in Europe.

* * * * *

To sum up, let us envision the seventh century world into which Islam was born, and realize the condition of the Graeco-Roman culture. This classic civilization had come to a standstill. It now lacked vigor, enterprise and spirit. In no world center was scientific activity being carried on.

The Arabs, erupting into this ancient and tired civilization, picked up the threads of ancient science and technology anywhere available and wove them into a definite pattern of progress. They salvaged the science of the classic world and developed it for five centuries. They enlarged the boundaries of all the technologies then known. But they were more than mere encyclopedists. They made practical application of this knowledge to the needs of the times. It was no

accident that the Islamic peoples attained such wide-spread prosperity and felicity.

In pursuit of these progressive goals the Arab scientists attained an experimental objectivity that the Greeks had disdained. They took a long step toward Bacon's noble vision of modern science: "by experimentation to discover truth and by the application of this truth to advance human progress."

This Arabic-Islamic science and technology, reaching Europe 'via Sicily and Spain' awoke her from the Dark Ages in which she was slumbering. The detailed elaboration of the actual routes by which this transference took place have only recently been outlined by historians. A hundred years ago a statement of the full influence of the Arabic culture on Europe would have been incredible. But modern research has firmly established its incontestability.

The Oxford History of Technology sums it up as follows: "There are few major technological innovations between 500 A.D. and 1500 that do not show some traces of the Islamic culture."

VII

Greek Science Reaches Europe from the Arabs and not from Constantinople

CONSTANTINE in 330 A.D. had selected the ancient Greek city of Byzantinin as the capital of the Eastern Roman Empire, rechristening it Constantinople. Such it remained until 1453 when the Turks, employing a new military technique, blasted with cannon its hitherto insurmountable walls and become its victorious rulers. In consequence many Greek scholars fled to Italy and there introduced the artistic and philosophical riches of ancient Greece -- a heritance which was an immediate, if not sole, cause of the Renaissance.

Yet long before that time virtually all the science and technology of the classic world had already been passed on to Europe by the Arabs -- a process which had begun before 1100 and was completed by the time Constantinople fell. Although this Arab revival of classic learning was the chief influence in Europe's scientific awakening, this fact has been popularly disregarded.

"Among writers who are not familiar with the history of science, it has been the fashion to speak of the great intellectual awakening of the 15th and 16th centuries as if it were closely connected with the artistic Renaissance of Italy under Byzantine influence.

"The truth is that the advance of science owed very little to the influx of classical models and classical texts from the Eastern Empire. That the fruits of Alexandrian science were harvested by the Arab learning and gradually introduced into northern Europe, was largely due to the influence of Jewish physicians who founded the medieval schools of medicine; and to the development of scientific navigation and its influence upon Europe, before the tradition of the Moorish universities had finally been extingiushed." *

* Lancelot Hogben-Science for the citizen, w. w. Norton, N.Y.C.

How was it that Constantinople, so long the center of Greek life and culture, had communicated so little to Europe during eleven centuries of alliance with the Eastern Roman Empire? The facts behind this situation reveal much of interest as regards the rise and fall of civilizations.

The Greeks of Constantinople were of the same gifted race who for the first time in history had dared to think. Standing on the edge of the abysmal universe, their forefathers had ventured to analyze its processes scientifically -- an exploratory adventure which paved the way for much of the world's subsequent scientific thinking.

After illuminating the ancient world for a while, the light of Greek science gradually dimmed. From the era of Constantine, Christian theology supplanted pagan philosophy and science and Greek genius was for the most part manifested in non-scientific pursuits.

The life of Constantinople, if not brilliantly scientific, was brilliantly luxuriant. Trade flourished with both the Orient and the Near East. The Greeks of Constantinople lived elegantly -- and exclusively. They had little contact with their fellow Christians of Italy and Western Europe, for both political and religious reasons.

Politically, the Eastern and Western parts of the Roman Empire after Diocletian were not only separate but often competitive. Their rivalry for control of Egypt and North Africa was especially intense, Thus during many periods the two governments were hostile to each other.

More serious still was the religious rift between the two parts of the Empire. This cleavage developed in 378 A.D. when Christianity was made state religion of the Eastern Empire and the emperor, by virtue of his office, became the head of the Eastern Church. At first the Church was more powerful in Constantinople than in Rome, where the popes were struggling to establish their authority. The Western Church finally gained dominance in Christendom by the adherence of the Visigoths to the Latin form of Christianity and their consequent allegiance to the pope.

With the achievement of this dominance the Papacy in Rome became the chief center of Christendom. Though many overtures were made to the Eastern Church for unity with Rome, they were to no avail. The hostility between the two erupted into violence in 1204 when the Fourth Crusaders, aided by a large Venetian fleet and by treachery within the city, captured the citadel of Eastern Rome. Their purpose, which had received the blessings of the Pope, was to force the Eastern Church to submit to the rule of the Papacy. This, in spite of their military victory, they were unable to do.

Though the Crusaders ruled the city until 1261, their acts of cruelty, ravage and pillage did not endear them to their Eastern brethren. The Crusaders found the Constantinople Greeks equally to their disliking, and though Constantinople remained an outpost of the Graeco-Roman culture, its people were antagonistic

and aloof toward the Roman Church and Europe.

Constantinople loved its past. It was the only place on earth where the "splendor that was Greece and the glory that was Rome" still survived. While Europe was still sunk in the vandalism, poverty, illiteracy and crudeness of the Dark Ages, Constantinople was worshipping in St. Sophia -- then and now the most exquisitely beautiful house of worship in the world. It was enjoying the sports of the Hippodrome, center of Byzantine life; and becoming rich with the trade that arrived and departed from its artificially made harbors.

The countries of Europe, on the contrary, enjoyed no pride in any past. Christian Europe had emotionally severed itself completely from pagan Rome and Greece. "Byzantium in Western eyes aroused wonder, envy, hatred, malice and a sense of perplexity at the difficulties which were raised by all attempts at reunion; but it did not arouse respect or encourage understanding. *

* R. W. Southern -- The Mohing of the Middle Ages-Yale

Such a hostile relationship was hardly conducive to the fruitful exchange of ideas. Until mid-fifteenth century, therefore, little of the vast body of Greek learning reached Europe from Constantinople, its logical source.

3

It was by a more circuitous route that the knowledge of the ancient Greeks first reached the European continent, and under considerably more favorable circumstances. Unlike the atmosphere of hostility which prevailed between Rome and Constantinople, a climate of amicability surrounded certain areas of Europe where Muslims and Christians lived side by side for centuries. It was in those areas that the transfusion of Greek science to Europe actually took place.

The Greek texts which the Arabs had translated into their own language over the course of centuries aroused deep interest in the West, and Latin scholars began to delve into the store of Greek-Arabic learning. A stream of knowledge now flowed from Arabic into Latin and reached Europe in that language.

"This marked the beginning of a one-way traffic in ideas which, hesitatingly in the eleventh century, but with rapidly increasing impetus throughout the twelfth century, transformed the scientific knowledge of the Latin West. Wherever the receding tide of Muslim power -- in Spain, Sicily and Southern Italy -- left men who knew Arabic or Greek and could serve as intermediaries between Christendom and the outside world, there were Latin scholars anxious to make use of these new opportunities. Scholars came to these centers from England, France, and Italy in search of knowledge; and slowly by their efforts and those of their collaborators, a new scientific library was built up more extensive than that which the European world had ever known." *

* R. W. Southern, oh. Cit.

The translation from Arabic to Latin was initiated by Constantine the African, a Christian monk living in Sicily in the middle of the eleventh century. As a member of the Benedictine monastery of Monte Carlo he translated a number of

Arabic works, chiefly in the field of medicine, into Latin.

The greatest translator of this period was Gerard of Cremona, who worked in Toledo between 1175 and 1187. He was the most important single agent in the rendering of Arabic texts into Latin, and was responsible for bringing Greek and Arab science to the attention of scholars all over Europe.

4

Of the works translated and passed on to Europe, the medical works of Galen and Hippocrates and the encyclopedic works of Arab medical scientists were the most important. They were to serve as textbooks in all the medical schools of Europe for several centuries. Aristotle's work on physics, astronomy, and botany were also introduced to Europe, and profoundly affected the theological, philosophical and scientific thought of Europeans throughout the Middle Ages. In addition to the volumes of Greek science, many scientific works of the Arabs -- Avicenna, Averroes, and Rhazes in particular -- were translated.

It is to be noted that this important work of translation, which inaugurated a new age for Europe, had been completed by the beginning of the thirteenth century -- the century in which the rise of the European university took place.

Thus these scientific works salvaged from Greek culture, plus the scientific contributions of the Arabs themselves, contained a body of knowledge ready for use by these rapidly growing institutions. The University of Milan, Padua, Paris, Prague, and Oxford -- all of which used Latin as their vernacular -- fully profited by the learning bequeathed them in these translations.

By the beginning of the fourteenth century Europe had at her disposal the science and scholarship of the classic age, enriched and transmitted by the Arabs, and the gulf which had fatefully divided Europe from her past was finally bridged.

VIII

Europe Develops the Scientific Attitude

RESEARCH, scientific discovery and technological change have accompanied, in due course of time, the development of Christianity in the West. But there is historical evidence that Islam at one time looked more favorably on scientific investigation than did Christianity.

From the beginning, Christianity appeared to be antagonistic to science. In the early days in Rome the Christian Church held itself apart from the Graeco-Roman culture. It did not, it is true, find it necessary then to persecute the devotees of this culture, since it was already dying, the Gothic invasions having virtually obliterated it. But later on, when the Eastern Catholic Church attained full power, it persecuted pagan philosophers and scientists, shutting down the Lyceum in Athens and laying a heavy hand on Greek philosophy in Alexandria.

For several centuries, therefore, the inheritors of the Arabic and Graeco-Roman sciences in Europe had to proceed cautiously. The chemists, who were at that period alchemists, had to keep their records in a sort of a code language. Even Leonardo da Vinci, as late as the fifteenth century, felt it wise to write his notebooks in a cryptic form.

Yet in spite of the Church, Europe was slowly emerging into a new realization of existence. A yeast was at work which would not subside until it had brought about, in Medieval Europe, an entirely new attitude toward life -- the scientific attitude.

2

The year 1492, which saw the fall of Granada and the final ebb of Islamic culture, witnessed also a rising tide in Europe which was to culminate in a wave of scientific modernism and the opening up of a newly discovered world.

Islamic science and much of Islamic culture may be considered to have come to an end with the expulsion of the Moors and Jews from Spain. For as we have seen, the Moors lapsed into a life of cultural stagnation in Morocco, in spite of their feeble attempt to continue the culture they had known in Spain. At the other end of the Mediterranean, the all-conquering but semi-barbarous Turks were eroding the Islamic culture of the Middle East as the Goths had eroded the Graeco-Roman culture of Europe.

From now on Islam existed in a twilight zone like that in which Europe had lived during her Dark Ages. The star of Islam had set. The star of Christendom was on the rise.

3

Europe now began her cultural ascent to heights undreamed of in the classical era, or in the period of Islamic culture. Wealth, the first requisite for the building of a great civilization, was at hand. Many cities of Europe and England prospered in manufacture and trade. Merchants and the nobility grew rich. The conquests of Mexico and Peru poured a gold and silver wealth into Europe. Colleges and secular schools received endowments, and education was encouraged.

The atmosphere of Europe was charged with enthusiasm -- the smell of success was in the air. European countries no longer comprised the mere fringe of a small continent. The whole of the New World now lay within their reach, waiting to be explored, conquered and settled. Africa was being navigated. And Europeans were reaching Asia via the Cape of Good Hope -- a route which later made possible the conquest of the Philippines, Indonesia and India.

Europe was in a ferment of excitement, enterprise and adventure such as the Arab world had experienced seven centuries before, when it was conquering and organizing the Islamic empire. The spiritual bond of a common faith and culture held her together, and the use of Latin as the common language of learning united European scholars.

Only one obstacle prevented Europe making the important scientific discoveries which were to change the face of the earth. That obstacle was scholasticism. This mode of thought -- inherited from Platonism -- imprisoned the Catholic Church for centuries in the doctrinal philosophy of Thomas Aquinas and Duns Scotus. It dealt with abstract ideas rather than with the concrete world, and spurned the lowly earth in its search for heaven."

This opposition to intellectual activity directed to practical purposes and scientific progress was due partly to the Church and partly to the limitations that had inhibited Greek thinking after the Age of Pericles.

The Greeks had investigated, travelled, observed and classified. But with the exception of a few scientists such as Archimedes they had not made experiments. The dawn of scientific thinking which had preceded the Age of Pericles was later dimmed by the growing popularity of logic.

To Plato, scientific study meant the study of the subjective world, the attempt to understand ultimate causes. Belittling the observational methods of the physical scientists, he once satirized astronomers: "It makes no difference whether a person stares stupidly at the sky, or looks with half shut eyes upon the ground. So long as he is trying to study any sensible object, I deny that he can ever be said to have learned anything. For no objects of sense admit the scientific treatment."

After Luther drove a wedge of separation between northern and southern Europe, the ensuing Reformation brought about the secularization of education. Protestantism allowed far more freedom to scientific investigation than Catholicism. And the necessity to compete with Protestantism forced the Catholic Church to compromise with science.

The restraints imposed by the Church upon scientific investigation were gradually dispelled. The death of Bruno at the stake for asserting, contrary to the Bible, Copernicus' theory that the earth revolved around the sun, was the last successful attempt of the Inquisition to throttle science. Though Galileo was later threatened with torture, the church made no attempt to execute him, confining him instead in his Florentine residence and assigning the recitation of psalms as penance for his heresies.

4

At the beginning of the seventeenth century, Europe was in possession of almost all that body of sciences and practical arts which Islam had salvaged from the ancient world, and the stage was set for the steady and rapid progress of European science and civilization.

Galileo must be looked upon as the inaugurator of the modern age of science. For by means of the telescope, previously invented in crude form in Holland and perfected by him, he established for all time the validity of the Copernican theory. His experiments with falling bodies brought him close to discovering the law of gravitation, and his investigations were of assistance to Newton. His contributions to the science of mechanics were numerous. Building on

scattered ideas and experiments of the past ages, he conceived the idea of force as a mechanical agent. His writings on dynamics and his solutions of dynamical problems paved the way for the discovery of steam power and the birth of the modern age.

Indeed, Galileo is the spiritual progenitor of the modern scientist. His method of combining experimentation with mathematical calculation has led to our age of power and the epoch of the atom.

5

Science made many forward leaps during the seventeenth century which Galileo had so brilliantly inaugurated. Kepler constructed his first telescope in 1611 and announced his discovery of the laws of elliptical orbits of the earth and other planets around the sun. He realized the influence of the moon on the tides, and discovered important truths about gravity.

In the field of medicine significant advances were being made. Based on the earlier work of Vesalius and Servitus, William Harvey published his theory of the circulatory system.

In 1620 Francis Bacon published his Novum Organum, one of the last works to be written in Latin by an English speaking person. This monumental work -- dedicated to the progress of humanity, the advancement of learning, and the development of science by the inductive and experimental method -- marks the definite turning point from the Greek and medieval practices of deduction and speculative analysis. Bacon insisted that the scientist must pursue investigation freed from all prejudices and preconceptions.

Realizing the social value of science, Bacon viewed it as one of the chief instruments of human progress. "The true and lawful goal of science," he said, "is none other than that human life be endowed with new powers and inventions." Thus did this great philosopher prevision the modern technological aspect of science.

6

With the heightening of scientific activity and the practical application of newly evolved theories during the seventeenth century, there began the rapid development which was to eventuate in the Power Age and transform daily living to an extent hitherto unimagined.

To Roger Boyle belongs the credit for a vast body of experimentation in the expansive power of gases which led to the eventual development of the steam engine and the harnessing of power. In many respects Boyle may be considered the father of modern science. Though inspired in his scientific work by Bacon, Boyle soon surpassed him in the practicality of his methods, checking his observations and experiments by precise measurements. He was one of the first of European scientists to wed theory with practice, and mathematics with experimentation.

In the field of physics Boyle was an immense influence for progress. After

giving to the world "Boyle's Law" -- that the pressure of gases varies inversely with volume -- he perfected the air-pump invented by von Guericke which was the precursor of the steam-pump and the steam engine. He also conducted important investigations on the expansive force of freezing water, on specific gravities, on hydrostatics and on electricity.

Interested in philosophy and religion as well as science, Boyle was, in fact, a universal mind -- akin to the best that the Greek world and the Islamic world had produced. Together with Bacon in England and Descartes in France, he inaugurated the scientific age in which investigation is based on experimentation, mathematical exactness and methodical planning. This was a very different kind of science from any that had existed in the past.

7

The course of the seventeenth century thus represents one of the most epic adventures of the human race. It was one of those periods when new things are brought into the world by men's creative striving.

"We may say that in regard not merely to the history of science, but the civilization and society as a whole, a transformation was becoming obvious in the latter part of the seventeenth century. We may take the line that here, for practical purposes, our modern civilization is coming out in a perceptible manner into the daylight." *

* Herbert Butterfield-The Origins of Modern Sejence -- Collier Bros.

We have seen the first steps toward one of humanity's greatest achievements, the substitution of the power of the machine for animal and human power. The next two centuries were to be marked by rapid strides toward the ultimate liberation of mankind from his ancient servitude to nature.

Historians advance several explanations for the eventual development of the steam engine. It has been suggested that climate was an important factor. Coal had been used for heating purposes since about 1500, especially in England which was favored with generous deposits of this mineral. It was the interest in problems of combustion which the burning of coal engendered, and interest in the nature of heat itself, which stimulated the discovery of the laws of expansion of gases and subsequently the availability of steam as a source of power. It is highly improbable that the discovery of steam power could have taken place in warm countries which had little need of artificial heat and which lacked sufficient supply of the fuels that the steam age required.

Another factor leading to the Power Age was the non-existence of slavery, and the increased need of manpower brought about by trade and industry. The power age probably would never have developed where manpower was cheap and plentiful.

8

The evolution of the steam engine was as follows. The first step in this direction was Von Guericke's development of the air-pump in 1650. Later perfected by Boyle, this device which employed the power of a vacuum to raise

weights led Newcommen to the invention of the vacuum pump in 1698.

Newcommen used steam to create the vacuum in his engine. But his method was so inefficient that he is not credited with the final invention of the steam engine. Credit is given to James Watt, the Scottish engineer who began his career as a mathematical instrument maker at the University of Glasgow.

Watt's friendship with Joseph Black, professor of natural history at the University, led him to consider the possibility of improving Newcommen's primitive steam engine. In order to make the necessary improvements and eliminate the enormous waste of steam, Watt undertook, with the aid of Professor Black, to make a scientific study of the properties of steam -- the relation of its density and pressure to its temperature. Out of these experiments came the world's first patented steam engine in 1769. Devoting the next ten years to perfecting his first model, Watt developed it until it included all the basic elements of the modern steam engine.

Great as had been the scientific contributions of the Greeks and the Arabs, they had changed but little the conditions of practical living which had prevailed since the dawn of history. Long before either of those civilizations had appeared, man had made his first monumental achievement -- the introduction of settled agriculture which freed him from the uncertainties of food-finding and transformed him from a hunter into a harvester.

Centuries elapsed before the Age of Power, man's second stage of progress, lifted him firmly and finally above the position of "thinking animal" and placed in his hands the tools for universal progress.

The world is entering now a third stage of development, the Space Age. The time may yet come when we shall link our will-to-progress with possible achievements on other planets of our solar system. More compelling, however, is the necessity for assuring peace and unity on our own planet, torn for millenniums by the cruel and wasteful ravages of war.

IX

The Rhythm of the Civilization Pattern

WE have traced the rise of Islamic civilization and its decline. We have also traced the beginnings of Christian European culture, which was destined to grow until it dazzled and dominated the rest of the world.

It is not difficult to determine the factors which contribute to the birth of civilizations, for history clearly indicates that certain conditions are conducive to the organization and expansion of cultures. First of all, the essentials of ordinary living must be readily available, in order to permit the leisure which allows the genius of a race to blossom forth. There must also exist a sufficient concentration of wealth to make possible the patronage of arts and sciences.

These factors were present, as we have shown, when Islamic civilization rose in Baghdad and Spain. They were present during the Age of Pericles when trade

brought wealth, and the labor of some 100,000 slaves afforded leisure to the average Athenian citizen. It was the successful cultivation of maize under state control which gave to the Incas the leisure and energy to build up their historic civilization. And in Europe it was the wealth provided by the rise of industry and trade and the accessibility of precious metals for coinage that made possible the Renaissance and gave Europe its start toward modernism.

Wealth and leisure, of course, are not enough. Carthage was rich, but her contributions to world civilization were scant. Something more is needed -- a racial elan, a self-realization and aspiration for progress, a motive force created by economic and political power.

Still another element -- perhaps the most important of all -- is required. To achieve cultural brilliance a race must have something to express. As in the case of individual achievement, there must be present some innate genius some spark of creativeness.

A superior civilization, once started upon its development, serves as a magnet attracting gifted individuals to its focus of opportunity. As Athens represented, in one epoch, all the creative genius of Greece, so Alexandria held the same position following the decline of Athens. Beginning with the eighth century it was the Muslim culture that became the focal center of world progress, attracting Jews, Persians, Christians, Copts, and even Turks. As Christian civilization began its ascent, the same gravitational attraction was exerted by Rome, Florence, Paris, Burges and Oxford. The greatest example of this gravitational pull is of course America, "the land of opportunity", whose progress has been assured by the combined contributions of the most ambitious and enterprising peoples of many national origins.

2

It is more difficult to establish the causes of the decline of civilizations than to trace the reasons for their rise. Decline of civilizations has been attributed by historians to many factors; and some, like Toynbee, have attempted to find a pattern that will account for all cultural descents. The facts remain that no greatly creative culture has ever maintained its highest elevation. Cultural peaks have always leveled off into plateaus, and it is our opinion that they always will.

Our modern age, however, presents a new cultural possibility -- that of constancy in the perpetuation of technological improvements. Mechanical techniques, once arrived at, need never decline. In fact, they appear destined to form the pattern of an ever-rising curve.

But mechanics and techniques alone do not constitute a truly vital culture. Spiritual values, aesthetic expression, and a "joie de vivre" of the people are the life-giving elements. How and when will the modern world grasp the vision for the creation of a culture as noble as its technology is great? How, in other words, will humanity rediscover its soul?

X

History Looks Ahead

HISTORY is more than a dramatic narrative of the world's chief events. Bacon said that history makes us wise. It does make us wise if we know how to read its truths.

Arnold Toynbee has devoted a lifetime delving into and elucidating some of the underlying meanings of history. If his theories at times seem to override his facts, he has nevertheless induced the whole world to view history with a more thoughtful and scientific attitude. We look back in order to look ahead. We have visions and we plan for the further onward march of humanity. With this philosophic attitude in view, what lessons for the needs of humanity today can we learn from the Arabic-Islamic period of culture?

(1) That peace is a necessity for cultural advance is a special lesson that the history of Islam teaches us. The regions which the Arabs first conquered had been eroded by constant warfare. Under Arab administration, in the name of Allah and the Koran, peace was established throughout the whole empire, eventually reaching from India to the boundaries of France. Under Islam merchants as well as scholars could travel from Samarkand to Spain. Trade brought a wealth to the rulers and merchants which could be devoted to the creation and spread of culture. Science, technology and the arts of daily living began to flourish greatly. Never before, in fact, had the common people lived so well; and the luxury of the upper classes was legendary.

(2) One of the chief causes of the prosperity of the people under the Islamic regime was the attention given to agriculture. The caliphs were very enlightened in this respect. They scoured the known world for new plants or varieties; they fostered with all the means at their command the use of irrigation; and they protected the peasant in his modest individual holding of land. They seemed to realize that agriculture is, indeed, the basic industry.

And so it is to this day. The greatest need of backward nations is to develop agriculture by promoting greater use of fertilizers, better plowing, better seeds and stock. The prosperity of all peoples springs from the soil. Technology applied to agriculture will bring greater rewards than in any other field of human endeavor. Such agricultural technology needs to be established and upheld, of course, by broadly extended education.

(3) Another notable feature of the Islamic epoch was the spirit of elan under which science flourished. Once the Arabs awakened to the values of science, they set about with great avidity to revive the knowledge of the Greeks and supplement it with their own research and innovation. Every Muslim center followed the example of Baghdad in founding universities, spreading literacy among the masses, and attracting physicians and scholars to their courts.

It is always in such periods of enthusiasm and zeal that civilization advances most rapidly. Today there is great zeal in the field of nuclear physics. That the chief motive in this field has been militaristic is not entirely derogatory to the tremendous advances nuclear scientists have made and are making. If the

world's scientific energies can be channelled into ways of peace, this new dedication of science will generate of itself new enthusiasms, until our whole planetary life vibrates with a zeal for progress such as has characterized all great cultural epochs.

(4) The importance of the linguistic unity which Islam established over its conquered peoples must not be overlooked. Arabic became the universal language of administration and also of culture, much as English became the administrative and cultural language of India. If the existence of a common means of communication was an advantage to the merchant class, it was an untold blessing to physicians, scientists, scholars and artists. These creators and purveyors of culture were able to travel from court to court, the whole Islamic empire offering them opportunity. Their horizons were broadened and their ambitions whetted by this favorable situation.

Europe of the Middle Ages also possessed, as we have seen, the advantage of having church Latin as a universal language for education, science and culture; and the scholars of Europe could range from university to university anywhere in Europe or in England and ply their scholarship in a language that was understood by all.

The world greatly needs a universal language today. A descendant of ancient Zoroastrian kings, Bahá'u'lláh, suggested over a century ago how this could be accomplished. Let all the countries of the world send delegates to an international convention whose purpose should be the selection of some one language, either existing or artificial. Then require this as a secondary language in all the schools of the world, and in a generation there would be established throughout the world a universal auxiliary language. This plan is so simple that only the jealousies of nations could controvert it. It is for this reason that the choice might fall on an invented neutral language like Esperanto or Ido. It would hardly be economical, however, to choose an artificial language possessed at present of only scanty literature in comparison, for example, with English in which the whole world's literature already lies embodied either originally or in translation.

The idea of a universal language may be one of those concepts which today is a dream and tomorrow a reality. Such a consummation would not only facilitate global communications but it would also promote greatly the advance of science and general culture. In fact, the day may well arrive when a planetary newspaper will be set up by teletype and published simultaneously in every capital of the world.

(5) Last but not least of the factors which advanced civilization in the Arabic-Islamic period was the devotion of the people to a common religion, and the devotion of religion to the common people. Islam was simple enough in its theology to be understood by all and demanding enough in its daily ritual of prayer and month-long fasts to enforce a discipline that engendered piety in the daily life. Islam lifted its adherents above consciousness of race or color, establishing an effective brotherhood in the name of Allah.

This religious unity underlay and fortified all other factors which made for the prosperity and cultural creativeness of those who, over half the globe, turned to Allah in prayer and gratitude five times a day. It was this spiritual unity that kept the Islamic world united culturally, even after it became divided into separate caliphates. Islam brought to pass a unity of mores and daily habits which gave stability to the new culture being created under the aegis of Allah.

* * *

The establishment of civilizations requires unifying forces. The more unifying the force, the more stable the civilization. Ancient Egypt maintained by means chiefly of religious devotion and motivation a civilization that endured for three milleniums. In a later age in which historic evidence is more available, we may trace some of the causes of the remarkable stability of the Chinese empire. Here we find the cohesive force of an ideographic script which united all varieties of spoken language and dialects. More important still has been the influence of Confucianism, reinforced at times by Taoism and Buddhism and absorbing the chief values of these rival truths.

For humanity today the urgent need is the establishment of world unity. Technology and science are modern forces of unification that exert everywhere a powerful influence. But beyond these forces, some world thinkers are also envisioning a unification of religious life upon the planet. Sorokin of Harvard suggests a synthetic religion combining valid truths from all the world religious. Aldous Huxley's 'Perennial Philosophy' stands ready as the textbook for such a religion -- a sort of universal bible composed from the world's chief mystic writings, with further exposition of his own -- an admirable book for those who are striving to reach high spiritual attitudes.

But Hocking, Harvard philosopher of religion, maintains that a synthetic religion is impossible, in that it would violate the very nature of religion. For all religions are believed by their adherents to be revelatory, hence not a truth, but the truth. However, Hocking does not elucidate how any of the existing world religions can successfully achieve the task of spiritually unifying our planet.

Toynbee also realizes the value and need of spiritual unity as a foundation and cementing force for the "one world" which seems to be approaching. A universal civilization implies a universal spiritual as well as secular attitude toward life. Indeed, Toynbee seems to suggest that it is the purpose of civilization to bring forth a universal church. He hopes that Christianity can broaden its theology sufficiently to accomplish this monumental task. But if Christianity cannot accomplish this, some new religion may arise, he states, capable of winning the whole world to its adherence.

One earnestly hopes that Toynbee's vision of the future may be prophetic. -- "When radiation has been followed by counter-radiation of influence, what will stand out will be a single great experience, common to the whole of mankind -- a new common life. . . . The historians of [the fortieth century] will say that

the impact of the Western civilization on its contemporaries, in the second half of the second millennium of the Christian era, was the epoch-making event of that age because it was the first step towards the unification of mankind into one single society. By their time, the unity of mankind will perhaps have come to seem one of the fundamental conditions of human life -- just part of the order of nature.

"And the historians of [the fiftieth century] will say, I fancy, that the importance of this social unification of mankind was not to be found in the field of technics and economics, and not in the field of war and politics, but in the field of religion." *

* Arnold J. Toynbee, civilization on Trial, Oxford.

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