

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

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**Foreword By
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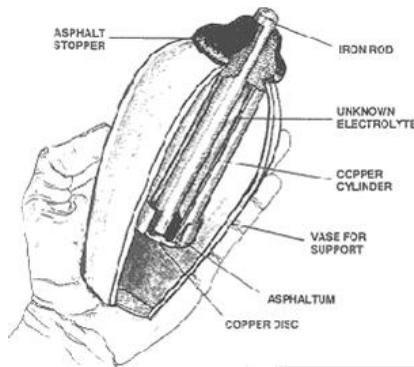
Ideology Behind the Creation of Prosperity and Wealth in Society

World's First Electrical Technologies, Windmills,
Highways; Postal Systems, Medical School.
Cooling and Refrigeration Systems,
Public Water Delivery Systems,
Seismic Systems

The First Suez Canal (500 BC)

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2.0 V batteries and electroplated
objects were found in 1938 at
what was the capital of Iran about
2000 Years Ago. See Slides 32-34.

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Foreword

by

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Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Foreword

Richard N. Frye
Harvard University

Persians are often remembered for their poetry, rugs and beautiful handicrafts. But this is only part of the story as regards their traditional crafts, for in the past many engineering feats were attributed to them, for example the vaulted arch on a dome, the wind catching apparatus called *badgir*, windmills, the *kahreez* or *qanat system*, as well as other inventions. This pre-supposes a knowledge of science and technology which enabled these inventions. Consequently the notion that the ancient Persians did not take an interest in scientific innovations is obviously unfounded and a re-appraisal of the contributions of this people to world history should be undertaken. Iran was not an area where only the humanities were developed, but for the sustenance of settlements much depended on their scientific outlook. A revision of the past is thus called for.

February 2008

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Prologue

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Afshin Zand

Prologue

The beliefs, values and morals in a society and the ideologies developed from or based upon them underlie economic development in general and the development of material culture and wealth. When an ethical system of beliefs and values comes to be implemented in a society and integrated with a system of social justice, at any age through history, it results in the development of prosperity and wealth enabling richness in the institutions of civilization. In contrast, the erosion and corruption of these values leads to the decline and fall of civilization.

The same values active in the past, for good or ill, underlying historical developments and events, are present and active in human society to-day. The facts presented here on material culture serve as a vehicle to convey these essential principles.

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Prologue continued

For humans beings, most of the struggle of life, whether in ancient times or at present, has consisted of how to make a livelihood. The effort is centered around material culture. The rivalry for livelihood impacts the relation between individuals within societies as it does, on a larger scale, between societies.

Various means of making that living has been observed throughout history, and at the present, ranging from creating it from nearly nothing to wheeling and dealing in the productivity of others, to taking from others by force, to, in a complex system of laws, through influencing and devising the laws that bring about effect transfer of wealth from those who create it to those who do not.

Though it may be possible for the privileged or strategically positioned and influential members of society to usurp wealth from the producers, by force or through machinations, this does not add to the net wealth in society. The existing wealth transfers hands through these means, is used and thereafter needs replacement. But at each such stage a greater, intangible and less unquantifiable loss occurs, and that is the confidence of the producers that they will see the results of their work.

The creation of livelihood and prosperity through work was seen by the ancient Iranians as their divine duty and became enshrined for the first time in World history into a code of ethics in Iran's pre-Islamic religion Zoroastrianism. It promoted the work of building, creating settlements and advancing civilization. Due to pursuit of livelihood through productivity as a way of life the Iranians adopted the self-appellation "the nobles".

In contrast to nearly all other civilizations, which were attached to a river system or built with slave labor, Iranian civilization was built by ordinary citizens in tens of thousands of agrarian oases, which one can regard as the equivalent of today's startups in the economy, and by paid labor.

Their ideology and its practice followed the world view of ancient Iran, as divided into the realms of *mainyu* and *gaiti*, or spirit and matter respectively (modern Persian *mino* and *giti*), and the ideal driving economic development and prosperity in society was to create a paradise on earth.

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Prologue continued

In modern times the same spirit, of creating wealth from nothing has been at work in the development of pioneer, agrarian societies such as the US, Canada, Australia, New Zealand, and other nations. In time the tools and implements for agriculture led to industry, and technological development. The Industrial Revolution spawned a series of technological revolutions, the combustion engine, electricity, telephone, television, electronics, computers to name a few. Technology served as the medium of economic development and transactions, but the same spirit of productivity and progress has been at work as ancient times, which we see today manifest in technology startups in Silicon Valley, the Boston area and elsewhere in the US, which has spread to the rest of the world.

To quantify work and productivity other than with silver or gold or other material, currency emerged, used as a medium of transaction in commerce. When the productive economy in a society succeeds, grows and expands, there comes into being an industry wheeling and dealing in these products, and in time a whole financial industry emerges, ostensibly to serve the productive sector. But being removed from productivity, different motivations run in this financial industry.

In time the financial industry expands, and grows beyond its initial mission. It becomes intent upon making money from money itself. It then begins to use money to influence the development and application of law in government, through controlling the finance of political campaigns. When through personal incentives for political leaders the act and right of creating the currency needed to quantify work in a society is taken away from the people who do the work and concentrated into the hands of a few, it no longer represents the economic productivity of society. The amount of currency or its ownership cease to corresponds to the goods and services produced. The few are able to create money for their own ends far greater than the total output of society. This then leads to a corruption of the system, and becomes the undoing of economic progress underlying material wealth and prosperity. In time it leads to the decline and downfall of that civilization.

This presentation renders available to the reader, from a wide variety of independent sources, with a minimum of commentary, the ideology and basic facts underlying material wealth, scientific and technological developments over the ages for one great historical entity Iran. The comparison with the United States and other pioneer societies will be noticed passim and concrete examples will be given.

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Prologue continued

Iran, in uniting various peoples, tribes, and nations and bringing into being a system for social justice and governance, as Hegel noticed, constituted in essence the first *United States*. Concrete examples illustrative of that are pointed out at appropriate junctures in the presentation.

Certain crafts and technologies were originated in Iran that have been in continuous use until today, chief among them *qanat systems* and windmills. Nearly all are in the category of what is considered “green-tech” to-day and some have direct applications to the present.

It is not implied that all the developments described here were exclusively of Iranian origin, for others contributed as well. Besides, the Iranians were heir to the Elamite civilization, and it would seem indirectly to the Sumerians as well. A solely Persian effort would run counter to the character and purpose of the Persian empire, which promoted multi-culturalism and multi-ethnic societies in peace. In this respect again the Persian empire was a forerunner of the U.S. and the world that is led by the U.S.

The great organizer of the Persian empire Darius went to great length in his inscriptions to describe the multi-national effort behind the building of Persepolis. As the Cyrus Cylinder stands today as the world first declaration of human rights, on display at the UN Security Council, so too Persepolis where all nationalities gathered stands as the precursor of the United Nations itself. Likewise Darius' successor centuries afterwards, Persian King Khosrow Anushiravan ("of immortal soul"), who built the great Reception Hall of Ctesiphon (now within the borders of Iraq) in the mid 500s AD, put the job of construction to bids and chose Roman engineers.

The study of material culture forms a crucial part of that of a people's history and this presentation is intended to provide an overview. For further exploration of topics dealing with material culture discussed herein, the reader is referred to the references throughout, as well as the bibliography at the end.

The term *World* is used in the historians' sense, capitalized to indicate the continuity of civilization from the Near East to Europe to US, which has now been spread globally.

Political attitudes from the street to the high echelons of government are colored according to people's notions of history.

From time to time we see it expressed in various popular forms including motion pictures such as the recent 300, often containing gross distortions of the truth even as reported by Greeks themselves, Plato, Xenophon and others, as will be seen in their words quoted here.

For clarity throughout, excerpts are in blue, whereas my annotation is in black.

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Major Topics Addressed

- Beliefs, Values and Ideology Underlying the Development of Wealth
- Science and Medicine
- Invention and Taming of Electricity : The First Batteries
- Subterranean Water (Qanat) Systems : 170,000 miles remaining within Iran
- The Building of the Suez Canal, ca. 500 BC
- Seismic Engineering in the Construction of Buildings
- The Construction of Persepolis with Integrated Channels
- Windmills and Wind-Catchers
- Astronomy and Astrology
- The World's First Highways : Forerunner of the Pony Express

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Ideology Underlying Material Culture

I. Beliefs and Values:

Ideology Underlying Material Culture and Prosperity

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Ideology Underlying Material Culture

From the Avesta, the Holy Books of Pre-Islamic Iran: The Places of Greatest Happiness on Earth

The First : “It is the place where one of the faithful steps forth”
i.e., to found settlements, civilization.

The Second: “It is the place where one of the faithful erects a house, with a priest within, with cattle, with a wife within, with children within, with good herds, and wherein, thereafter, virtue continues to thrive, cattle continue to thrive, provender continue to thrive, the dog continues to thrive, the wife continues to thrive, the fire continues to thrive, and every blessing of life continues to thrive”.

The Third: “It is the place where one of the faithful sows the most grain, the most grass, the most fruit trees . . . Where he irrigates soil that is too dry or drains soil that is flooded.”

- Sacred Books of the East, Oxford, 1895,
Vendidad, a pronunciation of Videvdad,
meaning how to do justice unto the dev (devil).

Etymology: *vi*, meaning *unto* in Avestan, evolved into *be* in modern Persian; *dev* or its precursor evolved into *div* in Modern Persian. The term *dad*, then as now, means justice in Persian. Thus *Videvdad*, popularly pronounced and written *Vendidad*, is the “Code to do justice unto the devil” by creating wealth through work, through agriculture, by removing from human beings the temptation to usurp or steal in making their livelihood.

From the Avesta, Holy Books of Pre-Islamic Iran:

“Whosoever sows grain, sows righteousness. He nourishes the Good Religion. He makes the Good Religion abound as much as . . . ten thousand sacrificial ceremonies.”

- *Sacred Books of the East*, Oxford, 1895,
The Avesta, Vol. 4, *Vendidad*, Fargard III, p. 30

Avesta, Tr. By Arthur Henry Bleek & Henry Spiegel, 1864
Vendidad, Fargard III, p. 24

Joseph Arthur, Count Gobineau:

“The Persians were the only fraction of humanity that ever considered work as an embellishing virtue, that recommended it so equal to a religious act, that celebrated all its majesty in their holy books . . . that resolutely condemned idleness as a degrading vice.”

- *Histoire des Perses*, 1869, Vol. 1 p. 30

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Ideology Underlying Material Culture

By partaking from the Zoroastrian work ethic each member of society gained a sense of dignity and self-worth, and in adopting that lifestyle they looked forward to work and achievement. This led to a high state of welfare, one that, as has been observed, would be difficult to surpass. Mazdaism is an alternate name for Zoroastrianism

George Foot Moore, Harvard Divinity School:

“No religion has set so high a value on agricultural labor as the service of God . . . From the first Mazdaism was thus directly a civilizing force.”

Zoroastrianism, Harvard Theological Review, 1912, p. 189

“The Zoroastrian religion was a religion of life in the noblest sense of the word . . . The poorest, the meanest Zoroastrian knows that he is born a soldier of *Saoshyant* [Messiah] and that *Ormazd* [the Wise Lord] will conquer through him.”

- *The Encyclopaedia of Religion and Ethics*, 1917-2001

James Hastings, Ed.

From the Avesta, Holy Books of Pre-Islamic Iran:

“To obtain the treasures of the material world, forgo not the world of the spirit.
For he, who, to obtain the treasures of the material world destroyeth the world of the Spirit, such a one, shall possess neither the Bull, nor Asha, neither the Celestial Light nor the Paradise of me, Ahura Mazda [Wise Lord].”

. . .

He is not mighty, who is not mighty in righteousness.

He is not strong, who is not strong in righteousness.

He has promoted nought and he shall promote nought.”

- *Sacred Books of the East*, Oxford, 1895,
The Avesta, Vendidad, p. 295-297

From the Avesta, Holy Books of Pre-Islamic Iran:

“Verily I declare unto thee . . .

That a man with a wife is far above he who lives in continence;
That a man with children is far above he who is without children;
That a man with a household is far above he who is without a household.”

- *Sacred Books of the East*, Oxford, 1895,
The Avesta, Vol. 4, *Vendidad*, Fargard IV, p. 46-47

Avesta, Tr. By Arthur Henry Bleek and Henry Spiegel, 1864
Vendidad, Fargard IV, p. 130-32

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Ideology Underlying Material Culture

Arnold Toynbee, Oxford University, Dean of World-Historians:

“The Greek accounts are the most copious, and their testimony to the virtues of Empire is particularly convincing, because the Greeks were hostile witnesses.”

Acta Iranica

Vol. I, *Hommage Universel*

1974, p. 17

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Ideology Underlying Material Culture

Plato's comparison of Iran and Greece in His Socratic Dialogues

SOCRATES to ALKIBIADES (nephew of Pericles, leader of Athens), comparing Iran and Greece:

“How ridiculous would you be thought if you were to make a display of your ancestors and of Salamis the island of Eurysaces, or of Aegina, the habitation of the still more ancient Aeacus, before Artaxerxes, son of Xerxes. You should consider how inferior we are to them both in the derivation of our birth and in other particulars. Did you never observe how great is the property of the Spartan kings? And their wives are under the guardianship of the Ephori, who are public officers and watch over them, in order to preserve as far as possible the purity of the Heracleid blood. Still greater is the difference among the Persians; for no one entertains a suspicion that the father of a prince of Persia can be any one but the king. Such is the awe which invests the person of the queen, that any other guard is needless.

...

I might enlarge on the nurture and education of your rivals, but that would be tedious . . . And if you cast an eye on the wealth, the luxury, the garments with their flowing trains, the anointings with myrrh, the multitudes of attendants, and all the other bravery of the Persians, you will be ashamed when you discern your own inferiority”.

- Alkibiades I

<https://ebooks.adelaide.edu.au/p/plato/p71a/introduction.html>

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Ideology Underlying Material Culture

Of Cyrus, Founder of the Persian Empire Reported by Xenophon, Disciple of Socrates, Peer of Plato

“Towards him the disposition of all men was such that every nation felt that they had failed unless they could send Cyrus the treasures of their land, plants or animals or works of art. And every city felt the same, and every private person counted himself on the road to riches if he could do Cyrus some special service.”

- Xenophon

The Education of Cyrus

Tr. by Henry Graham Dakyns, 1914, VIII.C.6.23

Cyrus to Croesus of Lydia (the World's richest man) reported by Xenophon:

““Helping my fellows, I purchase their love and their goodwill, and out of these I garner security and renown, fruits that can never rot . . . One thing more, Croesus, I would have you know; the happiest men, in my judgment, are not the holders of vast riches and the masters who have the most to guard . . . He, I hold, has won the crown of happiness who has had the skill to gain wealth by the paths of righteousness and use it for all that is honourable and fair.”

Xenophon:

That was the doctrine Cyrus preached, and all men could see that his practice matched his words.”

- Xenophon, *Ibid.*
VIII..C.2.23

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Relevance of the Past to Present

From Some of the World's Scholars of History

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

There is More Worthy to Know and Understand than on the News

Arnold Toynbee, World-Historian, University of London :

“The founding of the First Iranian Empire is an event of major importance not only in Iranian history, but in World history. The First Iranian Empire was the World’s sole superpower during the period of its existence and its posthumous effect on human affairs has been lasting. Nor is this empire merely an important landmark in mankind’s past ; it also has a relevance for the future. Now that technology has “annihilated distance” and has invented the atomic weapon, all the peoples of the world will have to unite with each other in some form as the only alternative to mutual destruction. This unification on a world-wide scale is going to be as difficult as it is indispensable. The statesmen who grapple with it will need guidance, and they will find this in the experience of past empires that have sought to unit the world. The First Persian Empire is one of those that came near to success. Its experience is therefore a matter of topical interest to mankind at the present day.”

Acta Iranica
Vol. I, *Hommage Universel*
1974, p. 15

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There is More Worthy to Know and Understand than on the News

Richard N. Frye, Harvard University, Dean of Iranian Scholarship in the World:

“The central fact of this culture is not so much that Persians of all classes know their history, for they do not, nor that they hearken back to Iran’s glorious past, though this they do. It is rather this somewhat intangible feeling among the people that Persian culture – traditions, outlook on life, and the like, - will always survive political domination and the onslaught of new ideologies, and that it is a privilege to partake of this culture.”

Iran, 1953, p. 21

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There is More Worthy to Know and Understand than on the News

The outward state of the Middle East today would not bespeak to the average person born in our time, what the deans of World-history Will Durant and Arnold Toynbee know. Will Durant commences his 11-volume work of a lifetime, after the prolegomena, on the opening page of Book 1 of Volume 1, with the following.

Will Durant, World Historian :

“In studying and honoring the Near East, we shall be acknowledging a debt long due to the real founders of European and American Civilization.”

The Story of Civilization (11 Volumes)
Vol. 1, *Our Oriental Heritage*, 1935,
Book One, p. 116

Albert T. Olmstead, University of Chicago:

“Under the rule of the Achaemenids, the civilized world came nearer to being under one political control than ever before or since.”

History of the Persian Empire,
1948, p. 465

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There is More Worthy to Know and Understand than on the News

The ideas, inventions, discoveries, arts and crafts which passed from Iran to Europe did so through many cultures and often through the verbal tradition, rather than with written records that have survived. Thus the knowledge of their source in the West was lost in the popular tradition and is known today mainly to historians.

“The heritage handed down by Iran to the West and still living in its ideological conceptions and cultural institutions is manifold. If its patterns are sometimes difficult to recognize and trace back to their origin, that is due to the fact that this legacy has been received through intermediate and Westernized models.

- Pio Filippini-Ronconi, University of Naples:
The Tradition of Sacred Kingship in Iran, in
Iran Under the Pahlavis, 1978, p. 50

“The neglect which has engulfed Persia and Persian history is the more remarkable when the range and splendour of her achievements are considered.”

- J. H. Iliffe, Director of the City of Liverpool Museums,
Persia and the Ancient World in *The Legacy of Persia*, 1953, p. 6.

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A Timeline

Approximate Timeline of Historical Figures and Events Referred to in this Document

Zarathustra	Aristotle places Zarathustra 6000 years before Plato. All other classical-age authors place him 5000-7000 years before Plato, but their underlying data is not available to us now. The latest research (by M. Boyce, Univ. of London) places him 1800-1200 BC, as Gathic is linguistically close kin to Vedic, there are similarities in their settings, and the Vedas are believed as having been composed in that time frame.
Achaemenians	(Cyrus, Darius . . .) 550 BC – 330 BC
Socrates	470 - 399 BC
Plato	424 - 348 BC
Xenophon	431 - 355 BC
Alexander	330 BC
Parthians	250 BC – 225 AD
Sasanians	225 AD - 635 AD
Advent of Islam	622 AD –
Ibn Khaldun	1400 AD

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Review of Primary Sources

Primary Sources Quoted on Iran

- 1) Xenophon of Athens wrote ca. 400-350 BC. Plato and Xenophon were the two disciples of Socrates of whom nearly all that is extant of Socrates remain. Xenophon spent a few years among Persians, wrote several books based on the knowledge he gained in that experience. He became the agent of transfer of Persian culture to the Greeks. Among these works are essays on *Horsemanship*, on *Hunting*, on economics or as it was, for the most part, in his time, estate management, *Oeconomicus*, *Ways and Means*, being a 'pamphlet on revenues' which was adopted by Congressional and State committees by that name in the United States and elsewhere.

Xenophon's descriptions of Iran, its customs, values, the qualities of its ideal leader, whom he saw in Cyrus the Great and some of his descendants, the specifics of its armed forces, weaponry, strategies, tactics, and the details of the route that he took from Greece and back in *The Persian Expedition*, served later as a guide for Alexander who was intent on realizing the long-standing dream of the Greeks, of destroying Iran, despite the fact that along with it they would destroy the peace and prosperity that the world had enjoyed for over two hundred years.

The exploits of Alexander to-day are typically recounted in glowing terms. Yet, as H. G. Dakyns scholar and translator of Xenophon and others have pointed out, '[Alexander would not have been great but for Xenophon](#)'. Other European historians have remarked, indeed, how Alexander set back and delayed the current World civilization by about 2,000 years. Having little or no ability to organize, administer and manage an empire that he gained not through building but through conquest, and lacking the ideology that would be requisite of such abilities, Alexander's empire quickly disintegrated after his death. While he was alive, he had to copy as much of the system Iranians had put in place as he had left intact. He also tried to adopt Iranian customs and believed in a blending of the cultures of East and West.

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Review of Primary Sources

Primary Sources Quoted on Iran

- 2) Ibn Khaldun, ca. 1400 AD, the first scholar of the causality in history. What Ibn Khaldun has accomplished is akin to modern systems analysis in engineering. He identifies the cause and effects that underlie historical processes and events. When the causes he identifies are set in motion, he demonstrates, the outcome is a logical conclusion.

Robert Flint on Ibn Khaldun:

“As regards the science or philosophy of history, Arabic literature was adorned by one most brilliant name . . . Plato, Aristotle and Augustine were not his peers, and all others were unworthy of being even mentioned along with him.”

History of the Philosophy of History, as quoted by Charles Issawi (below)

Arnold Toynbee, Dean of World-historians on Ibn Khaldun:

“In the Prolegomena to his universal history he has conceived and formulated a philosophy of history which is undoubtedly the greatest work of its kind that has ever been created by any mind.”

A Study of History, Vol. 3, 1950, p. x

Charles Issawi, American University of Beirut on Ibn Khaldun:

“More than any of his contemporaries, whether European or Arab, he tackles the kind of problem which preoccupies us today . . . Moreover, his positive outlook and matter of fact style renders him particularly congenial to the modern mind.”

An Arab Philosophy of History:

Selections from the Prolegomena of Ibn Khaldun, 1950, p. 2

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Comparison with the Development of the U.S.

The eagle was the symbol of statehood adopted by Iran and later in Rome. Similar symbolism of state was adopted in the United States*:

“The standard was a golden eagle, with outspread wings, born aloft on a long spear-shaft, and to this day such is the standard of the Persian king.”

- Xenophon (disciple of Socrates),
The Education of Cyrus (Cyropaedia)
ca. 360 BC, VII C.I,

* The bald eagle, which was more prevalent in North America, unlike the golden eagle, did not catch its prey live. President Theodore Roosevelt preferred the bear as a symbol of the state.

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The Earliest Medical Schools and State Health Care

Among the many books of Thomas Jefferson were two copies of the *Cyropaedia*, or *Education of Cyrus*, by Xenophon, the bible of leadership for Alexander, Julius Caesar and others since ancient times. Xenophon, one of two disciples of Socrates, along with Plato, from whom any record of Socrates remains, spent a few years in Iran in the employ of one of the princes, and as his writings on agriculture, estate management, horsemanship and cavalry demonstrate, served to convey Iranian culture and civilization to the Greeks.

Xenophon on Cyrus the Great's provisions of state health care:

“He observed that the majority of mankind, if they live in good health for long, will only lay by such stores and requisites as may be used by a healthy man, and hardly care at all to have appliances at hand in case of sickness. But Cyrus was at pains to provide these; he encouraged the ablest physicians of the day by his liberal payments . . . “

The Education of Cyrus (Cyropaedia), VIII.24

J. H. Iliffe, Director of the City of Liverpool Museums:

“Encouragement was also given to the development of the sciences, e.g. astronomy (which could be useful in navigation), by Darius, who also founded in Egypt the earliest medical school of which we know.”

The Legacy of Persia, 1953, p. 10

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Extant Records

Two hundred years after the founding of the Iranian state by Cyrus and Darius and the passing of its pioneers, the princes came to be raised in harems and then at court and had few of the qualities of the founders. Then Alexander came on the scene. There had been many aspiring “Alexander's” in the preceding centuries. What made Alexander ‘Great’ was the internal weakness of Iran and how Xenophon before him had recorded in detail military techniques and exercises of Persia and the route he took to go there.

Cyril Elgood:

“So thorough was the destruction that Alexander the Great inflicted on Persia that there are not sufficient remains to allow one to estimate the mathematical knowledge of the early Medes and Persians.”

Persian Science

In The Legacy of Persia, 1953, p. 296

Ibn Khaldun:

“There are many sciences. There have been numerous sages among the nations of mankind. The knowledge that has not come down to us is greater than the knowledge that has. Where are the sciences of the Persians that ‘Umar ordered wiped out at the time of the conquest! Where are the sciences of the Chaldeans, the Syrians, and the Babylonians, and the scholarly products and results that were theirs! Where are the sciences of the Copts, their predecessors! The sciences of only one nation, the Greeks, have come down to us, because they were translated through al-Ma’mun’s efforts. His efforts in this direction were successful, because he had many translators at his disposal and spent much money in this connection. Of the sciences of others, nothing has come to our attention.”

The Muqaddimah (Prolegomena to History)

Translated by Franz Rosenthal,
1958, I.63, Vol. 1, p. 78

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Records of History

The eye-witness account of a Chinese Envoy Sz-ma Ts' ien, ca. 100 BC describes how Persians wrote on leather, and again also indicates extensive agriculture. Note that a *li* , Chinese unit of distance, varied by region. It is believed to have been equivalent to about 400 meters in some areas. It has today evolved to be 500 meters, or about 1650 ft.

Sz-ma Ts' ien:

“Parthia is some thousands of *li* to the west of Ta-yueh-chi. Habits settled, with tillage of the fields, and cultivation of rice, wheat, and grape wine . . . There are bazaars, the people and the traders making use of carts and boats to travel to the adjoining states, sometimes several thousand *li*. They use silver for coins, the coins showing their King's features . . . They make signs on leather, from side to side, by way of literary records . . . From Ta-yuan westwards to Parthia, the states, though varying considerably in dialect, are still of much the same manners, and know each other's speech. The people are all deep-eyed, and mostly bearded and whiskered.”

Translated by E. H Parker in
Chinese Knowledge of Early Persia,
Asiatic Quarterly Review, Jan-April 1903, p. 145

It is estimated that what is extant today of the Avesta is, if measured by length of the text, about a quarter of the original. The legend that the collection of the holy books of the Persians before Islam, the Avesta was written on 12000 ox hides thus may be accorded is given some credence by the above observation. The ox hides are believed to have been burned by Alexander the Great.

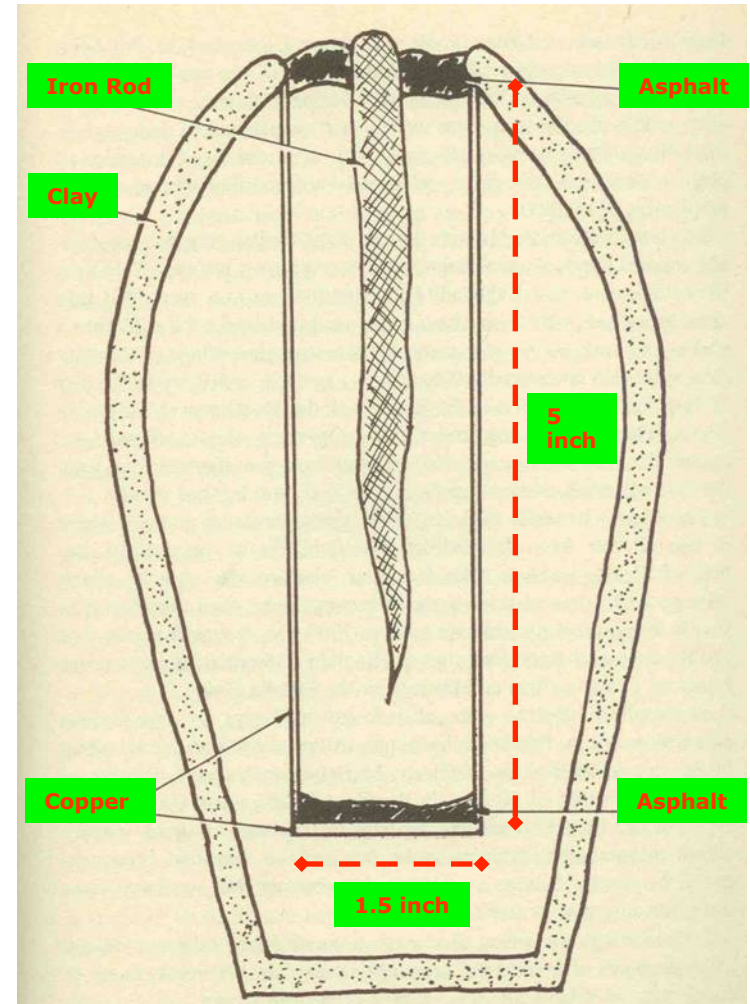
II. The World's Earliest Electrical Technologies

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The Earliest Batteries

The Earliest Batteries

Discovered at Ctesiphon, capital of Iran prior to Islam, now situated in Iraq near Baghdad, and in several other sites nearby, dating from 2000 years ago during the Parthian period, Iranian dynasty (ca. 250 BC-225 AD). Battery function in these clay pots was first noticed at the Baghdad Museum by Dr Wilhelm Konig, German archeologist in 1938 looking at them in the museum. Thereafter they were reconstructed by Willard Grey of General Electric High Voltage Laboratory in Pittsfield MA. Using acids available in the ancient world, such as citric acid and acetic acid (from vinegar), he found the ancient battery generated between 1.5 and 2.0 Volts. Moreover, the edges of the copper cylinder inside appear to have been soldered with 60/40 lead-tin alloy, much the same way as in electronics labs and manufacturing lines in our day. Electroplated objects that remain behind indicate perhaps it was used to electroplate jewelry, weapons, coins, cosmetic tools and other tools, and metallic objects. Various possible medical uses have also been put forward. Older electroplated objects indicate the first batteries may well even predate these.



Main Drawing ; Willard Grey, GE High Voltage Laboratory

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

The Earliest Batteries

David Down, biblical archeologist:

“Fifty years ago, the then Director of the Baghdad Museum, Wilhelm Konig, reported the discovery of an electric battery 2,000 years old. You had not heard about this sensational discovery? We can tell you why. It did not fit in with the established viewpoint, and most archaeologists did not want to know about it. They hoped it would go away.

But Konig’s electric battery did not go away. In fact a lot more of them were found in Parthian settlements near Baghdad.”

- *Creation*, March 1994, p. 10

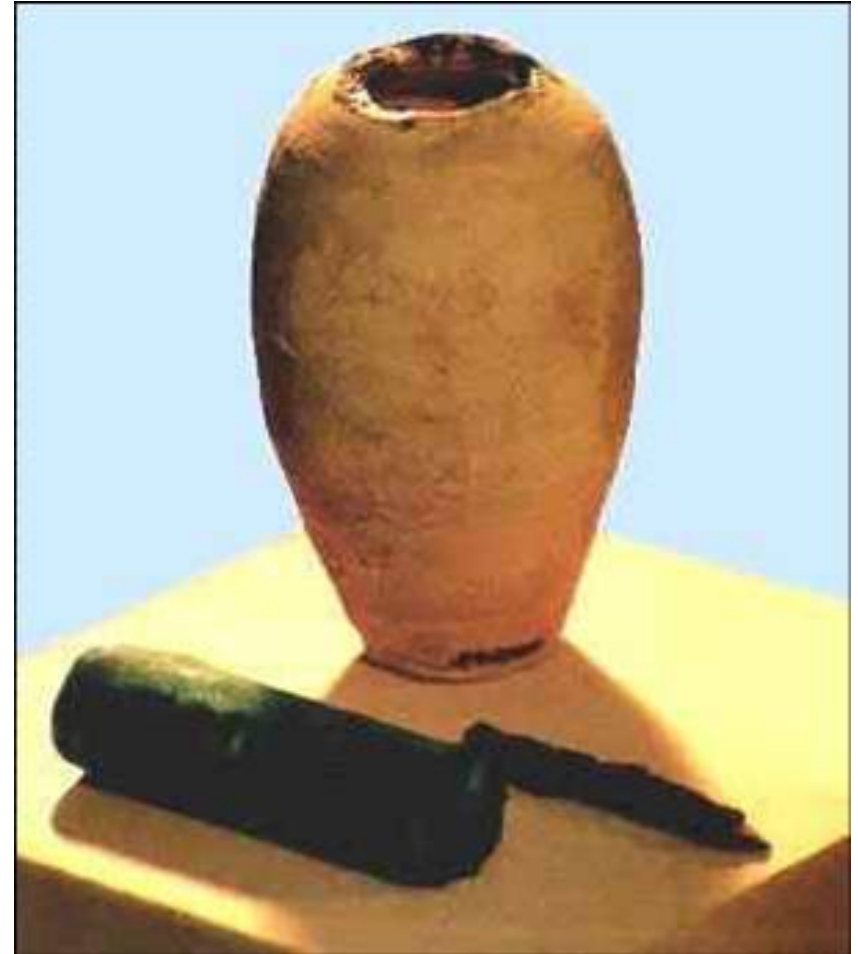


Photo : World Mysteries

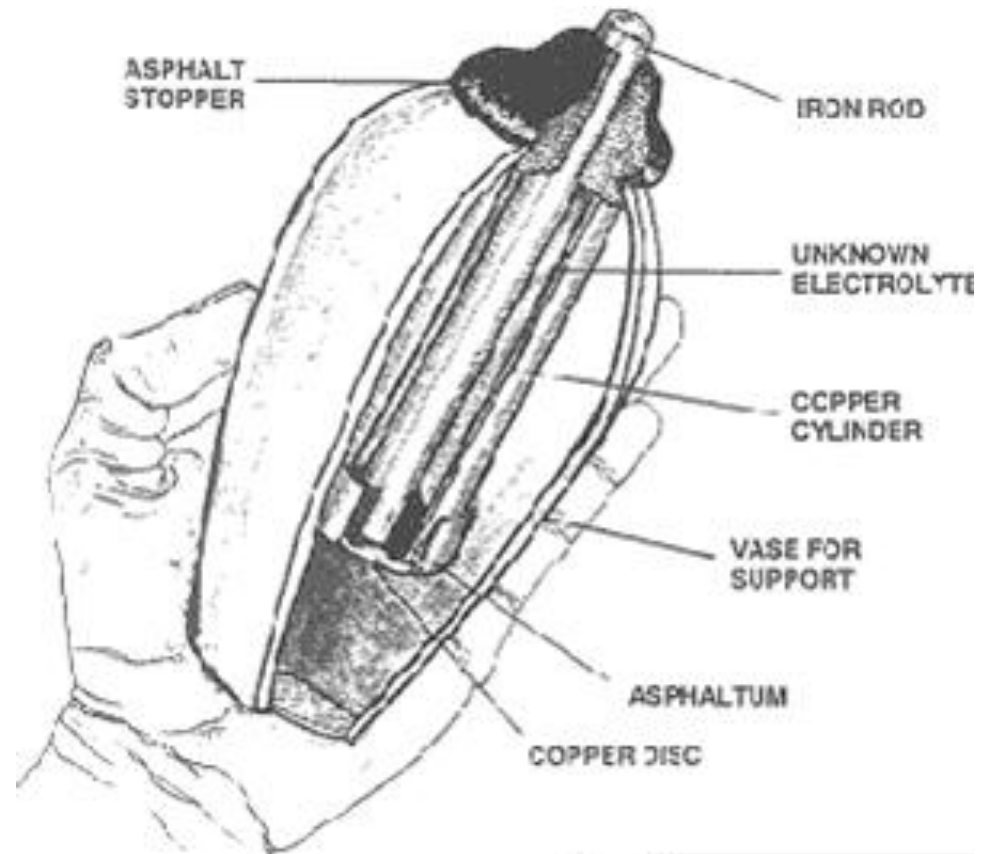
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The Earliest Batteries

The batteries of 2000 years ago were small enough to fit into a human hand, as today.

Found in the process of being manufactured in lots. Capable of generating up to 2.0 V.

Since there are electroplated items found dating prior to this period, it is likely that batteries had been in use for much longer.



Drawing : David Down

III. The Earliest International Public Works

Forerunner of Modern Highways,
of USPS . . . FedEx . . . UPS

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Comparison with the Development of the U.S.

Royal Mail

Ideas that Found Expression in the United States:

The Pony Express of the 1860s

The US Post Office . . . FedEx . . . UPS

Herodotus :

“There is nothing in the world which travels faster than these Persian couriers. The whole idea is a Persian invention, and works like this : riders are stationed along the road, equal in number to the number of days the journey takes – a man and a horse for each day. Nothing stops these couriers from covering their allotted range in the quickest possible time. Neither snow, rain, heat nor darkness.”

The Histories, Book VIII.98

Translation used by the Post Office, by George H. Palmer, Harvard University:

“Neither snow nor rain nor heat nor gloom of night stays these couriers from the swift completion of their appointed rounds.”

J. H. Iliffe:

“Along these roads, radiating from Susa, the administrative capital, to the remotest corners of the empire, the king’s post traveled, bearing his instructions to satrap and general, and bringing back reports on the condition of affairs. Where the king’s messengers went, others could go, if at a slower pace, and trade also followed the flag.”

The Legacy of Persia, op. cit. p.8

IV. Early Seismic Engineering

The First Suez Canal

The First Highways

The First Mail Service

ca. 500 B.C.

. . .

“Achievements of which a modern state might well be proud”.

- J. H. Iliffe,
Director of the City of Liverpool Museums
in *The Legacy of Persia*, 1953, p. 9

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Seismic Engineering 500 BC Employed Today

Plutarch (ca. 85 AD) on Alexander and the Tomb of Cyrus:

“Having discovered that the tomb of Cyrus had been rifled, he put to death the perpetrator of the deed, although the culprit was a prominent Macedonian native of Pella, by name Polymachus. After reading the inscription upon this tomb, he ordered it to be repeated below in Greek letters. It ran thus:

"O man, whosoever thou art and whencesoever thou comest, for come I know thou wilt, I am Cyrus, who won for the Persians their empire. Do not, therefore, begrudge me this little earth which covers my body."

These words, then, deeply affected Alexander, who was reminded of the uncertainty and mutability of life."

*-Plutarch's Lives,
The Life of
Alexander, 7.69*

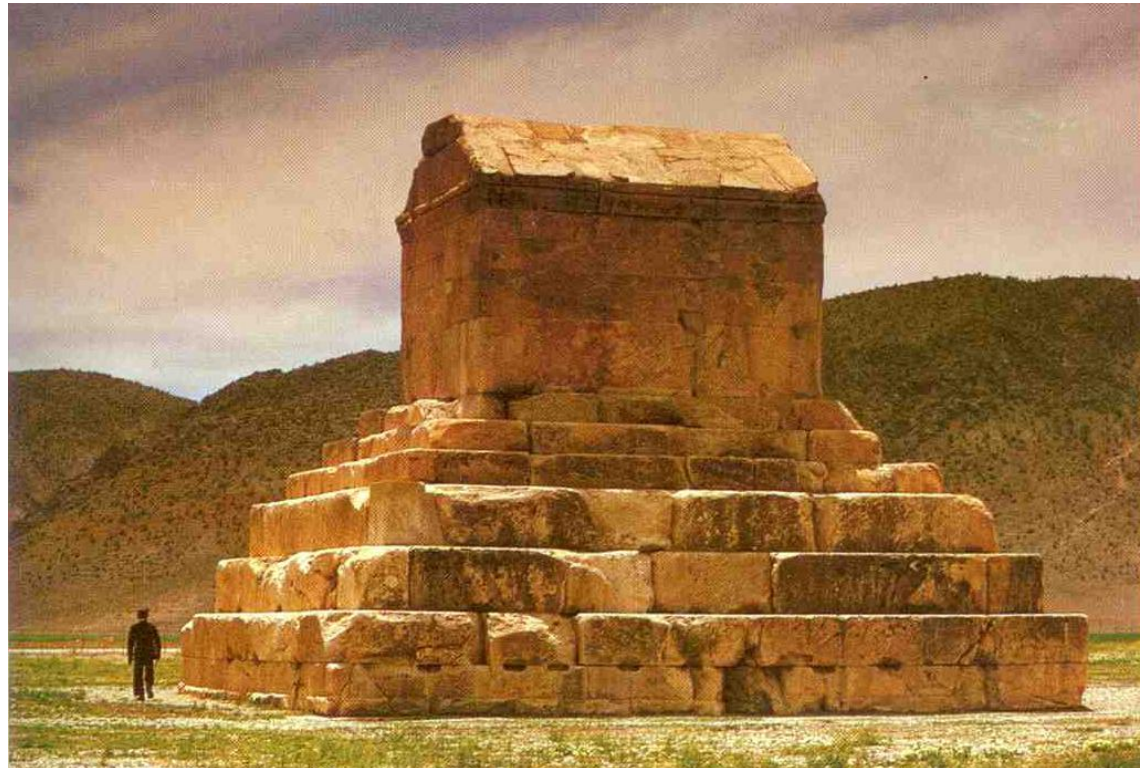


Photo : Bruno Barbey

Expression of Beliefs and Values in Material Culture :

Major Crafts and Public Works

Seismic Engineering 500 BC as Today

“The new research on Pasargadae’ structural engineering has shown the Achaemenid engineers had laid its’ foundations by using “Base Isolation System” in their design. The Base Isolation system is being used today by many countries for the construction of the nuclear facilities, and countries with numerous earthquakes such as Japan.

The “Base Isolation system” was invented by Iranian engineers 2500 years ago, by creating two separate layers of foundations; -the first or lower foundation was constructed solidly and second or the top foundation was susceptible to movement. Therefore, if an earthquake would have occurred the structure could withstand up to 7 richer-scale. The foundation designed to slide and shake without causing the structure to collapse.

“Under the Pasargadae monuments there are two foundations, the lower one solid, made of stone, and cemented together using Sāroj mortar (mixture of plaster of lime and ashes or sand). After creating a smooth surface the second foundation was laid out of wide pieces of polished stones, fastened together with metal bars and clips to create a large plate, which were trembling and sliding during a possible earthquake”, said ‘Abdolazim Shah-Karami, the expert of Geotechnique, Foundation and Engineering of Pasargadae. “

The buildings at Pasargad are found to have had two foundation, the lower one much larger than the upper and acting as interface.



- CAIS, London

<http://www.cais-soas.com/News/2006/August2006/27-08-achaemenid.htm>

<http://www.iran-daily.com/1383/2216/pdf/12-art.pdf>

Photo : Renato Ottria

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

The Suez Canal

When the French set out to build the Suez Canal in the late 1800s, they came upon several stelai left behind by Darius the Great. Much like his Naqsh Rostam inscriptions in Iran, Darius says:

"I am a Persian. From Parsa I conquered Egypt. I commanded this canal to be dug from the river Nile by name, which flows in Egypt, to the sea which goes from Parsa. Afterward this canal was dug as I commanded, and ships passed from Egypt through this canal to Parsa as was my will."

Translated, Roland G. Kent
Old Persian Texts, JNES, 1942, I, p. 415

Silted up remains of a passage indicate there may have been built a similar canal over seven hundred years prior to the time of Darius, who built the canal ca. 500 BC. The Egyptians themselves had tried to build one again ca. 600 BC, as Herodotus reports (next slide) but were wary of completing the work out of the fear that it would only benefit other states or rising powers seeking a passage, or that the levels of the two bodies of water were different and thus it would bring about a flood.

Expression of Beliefs and Values in Material Culture :

Major Crafts and Public Works

The Suez Canal

Herodotus on the Suez Canal:

“The construction of this canal in the time of king Necos [ca. 600 BC] cost the lives of 120,000 Egyptians. Necos did not complete the work, but broke it off in deference to an oracle, which warned him that his labor was all for the advantage of the ‘barbarian’ – as the Egyptians call anyone who does not speak their language.”

- *The Histories (The Persian Wars)*, II.160

George Cawkwell, Oxford University:

“The Persian empire, compared with what preceded it, was a miracle. It brought peace . . . It brought justice . . . It brought prosperity, for the Persians devoted themselves to the improvement of agriculture. The Persians were the great gardeners of antiquity . . . In similar spirit they attended to agriculture in general . . . Likewise with communications. The great roads were built for the movement of armies, ‘carriage tracks’ like the road taken by Cyrus and his wagon train, but they served the purposes of peace as well. The Suez canal was built by Darius I purely for trade. The whole empire from India to the Aegean was to be linked by sea as well as by land. All in all, Persia was one of the chief civilizing forces of history and the Greeks, in calling them ‘barbarians’ as they did all who did not speak Greek, have greatly misled posterity.”

- G. Cawkwell, Introduction to *The Persian Expedition* of Xenophon
1972, p 32-33

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

“Achievements of Which a Modern State Might Well be Proud”

J. H. Iliffe on the taxation system of pre-Islamic Iran

“This taxation was based on a careful survey of the whole empire by Darius, an achievement comparable to Domesday Book¹, and one of his chief titles to fame as an administrator. In return for this taxation the Persian Empire gave its inhabitants very considerable benefits : these included peace, except for the Greek war, and a policy of development by such means as the institution of a coinage system, great public works, for example the completion of the Nile-Red Sea Canal, and the dispatch of exploring expeditions like that of Scylox from the Indus to about Suez, part of a policy of Darius to make Persia a sea power; all these achievements of which a modern state might well be proud.”

- J. H. Iliffe, Director of the City of Liverpool Museums,
Persia and the Ancient World
The Legacy of Persia, 1953, p. 9

¹ Domesday Book commissioned in England by William the Conqueror, ca. 1085 AD

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Organizing and Administering an Empire

“The Persian Empire provides us with the first provincial system we know. One of the principal links in its system of government was the satrap, or provincial governor: the word has now become domiciled in English.”

- J. H. Iliffe, Director of the City of Liverpool Museums,
Persia and the Ancient World
The Legacy of Persia, 1953, p. 8-9

V. Renewable Energy and Water Sources

Windmills

7th-10th Centuries AD in Iran
Whence they Spread to Europe

The *Badgir* or Wind Catcher & Cooler :
The First Structurally Integrated Central Air Conditioning Systems

Qanat or *Kahreez* Systems,
Tapping and Delivering Underground Water Sources

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Renewable Energy : Windmills

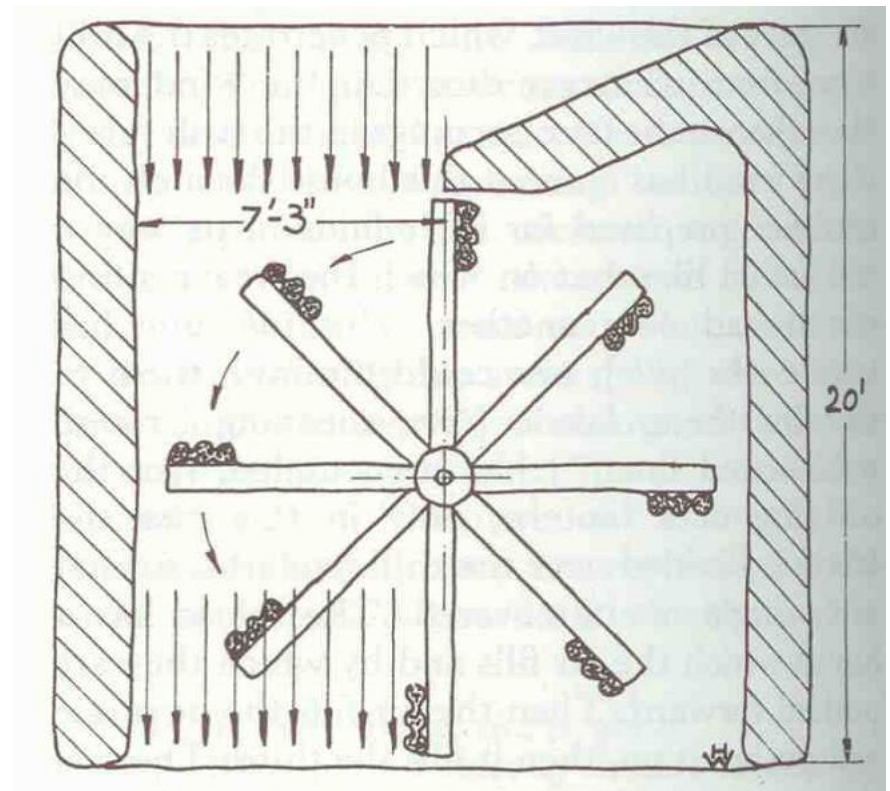
“Most modern authors on the history of technology agree on the Persian origin of the windmill.”

- Hans Wulff, *The Traditional Crafts of Persia*, 1966 p. 284

Cross-section of a windmill most common in southeastern Iran, showing opening for wind, and wind direction.

With a vertical spindle, the rotating blades pass with each rotation in front of an opening into which the wind blows.

The stone burrs for grinding in the original design were situated above the vertical spindle; later designs below it.



Plan View

Drawing : Hans Wulff

Comparison of Vertical-Axis and Horizontal-Axis Windmills

The original windmills as developed in Iran feature a vertical spindle. Above or below this spindle are situated the stone burrs which mill the grain. The windmills of Europe use a horizontal axis. The motion is then transferred to a vertical axis by a stage of gears which then turns the burrs.

The vertical axis windmill, featuring direct transfer of energy, undergoes less transfer loss, but also catches less wind power, its blades exposed to the wind being at lower heights.

The horizontal axis windmill catches more wind power by virtue of its higher elevation and exposure to wind, but loses some of it in the process of transfer noted above and resultant increase in entropy (Second Law).

Modern analogy in data terms : Conversion of Ethernet to ATM and back, as in PONs, each time losing about 10% of throughput.

Efficiency and Throughput of Vertical Windmills

“The 50 mills that were still operating when the writer saw them in 1963 in the town of Neh¹ had a seasonal throughput of 6,000 tons of wheat, a significant amount for a small town on the fringe of the desert . . .

Based on Gabriel’s measurement of the wind velocity at Neh in the middle of the “wind of 120 days” of $v = 32$ m/second, the observed speed of $n = 120$ r.p.m., the conservative assumption that only 1.5 blades are exposed to the wind at any time, and a mill efficiency of only 50 per cent, the mill would have a power output of about 75 HP. A modern grain mill recently installed in Neh to work outside the wind season was said to have only half the output of the windmill, i.e., half a ton in 24 hours. It was driven by a diesel engine of 40 HP, a figure confirming the above estimate.”

- Hans Wulff, op. cit. p. 289

¹ Neh, a town in Sistan, SE Iran

Available evidence points to windmill technology having spread from Iran to Europe between the 7th and 11th centuries AD. The vertical spindle windmill then evolved into the horizontal spindle:

“We have clear evidence of unmistakable links between lands adjacent to Seistan, a country of winds and windmills in Persia; and at the other end of the chain, lands adjacent to Holland, a country of winds and (at least at a later date) of windmills in western Europe.”

- Hugh P. Vowles,
An Inquiry into Origins of the Windmill,
The Newcomen Society for the Study of the History of
Engineering and Technology,
Transactions, Vol. XI, 1930-31 p. 11

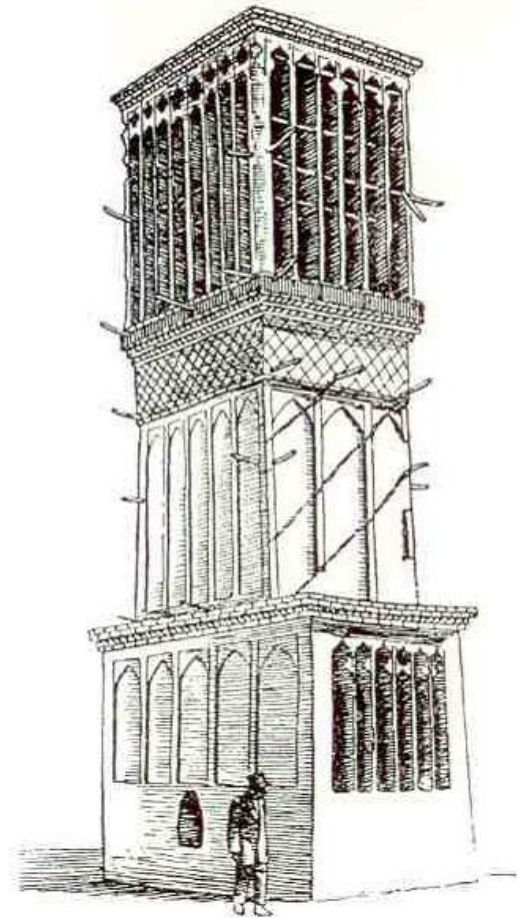
Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

The Badgir, or Wind-Catcher: Cooling and Refrigeration

Badgir or Wind-Catcher

On a high, mountainous plateau as found in Iran or the American southwest, the air is relatively cool in the summer, except during brief hot-weather spells, while the sun feels quite hot, heating buildings. Moreover, the air is dry, so it can accept moisture which acts to cool it.

The Badgir, or wind-catcher, is the traditional means for air conditioning in Iran. It works by routing the passing air incident on its intake vents down and over a pool of water fed by a qanat system, or through a qanat shaft and conduit underground and then back up via another shaft, to cool as well as increase its moisture content, then sending it on to the rooms in the building.



Drawing :Arthur Upham Pope

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

The Badgir, or Wind-Catcher: Cooling and Refrigeration

A Pair of Badgirs Attached to a Large-Scale Ice-Pit, *Yakhchal*

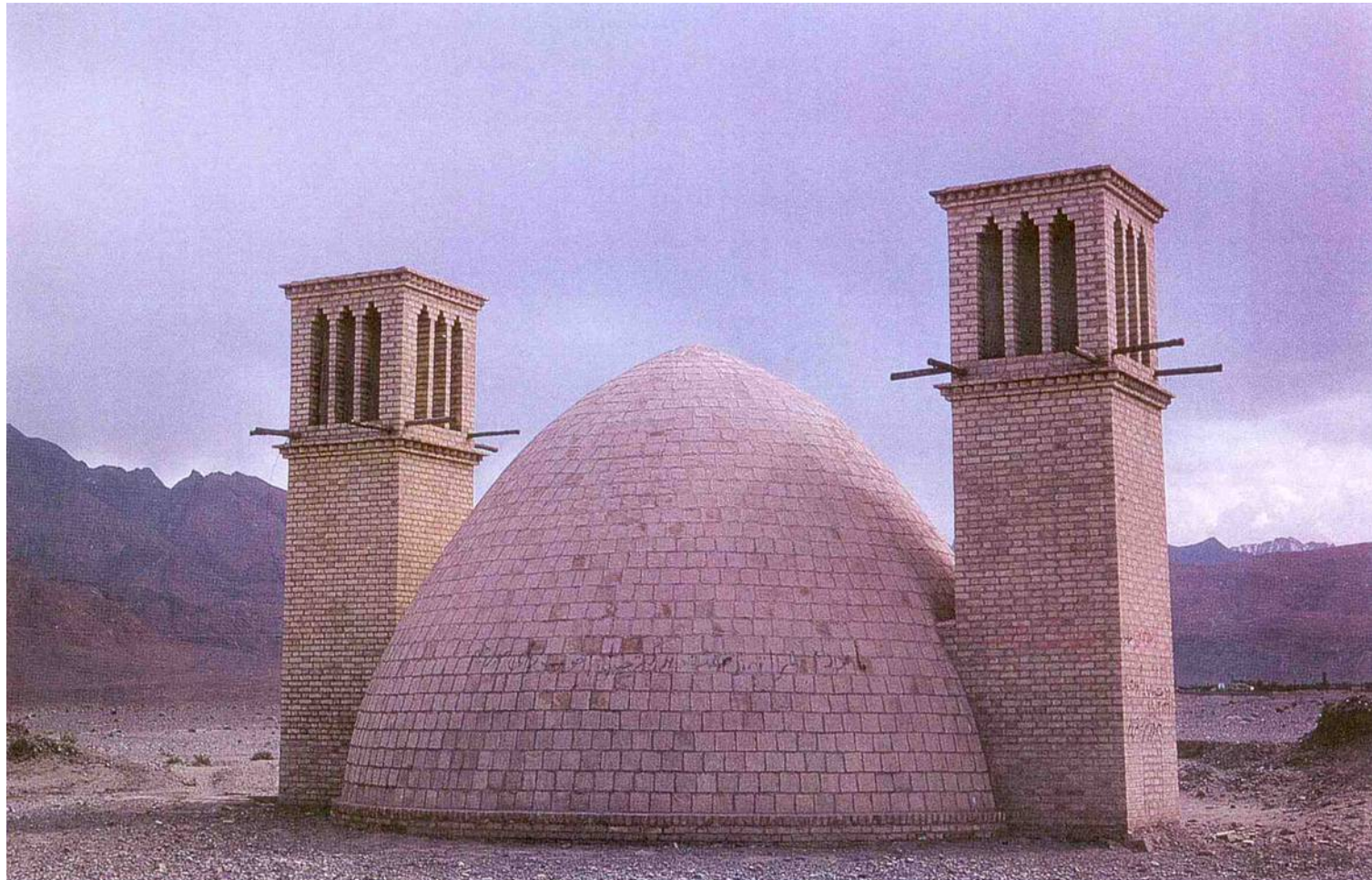


Photo : E. Beazley

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Qanats : Subterranean Water and Delivery Systems

Subterranean Water: Qanat (or Kahreez) Systems

Over 170,000 Miles Within the Borders of Today' s Iran

Ronald W. Ferrier :

“Persian imagination and ingenuity is unrivalled in making the best use of water in the desert and in this the country' s contribution to the world' s technology is unique”

The Arts of Persia, 1989, p. 115

Director General of Unesco, Rene Maheu, on the *Qanats* of Iran:

“Some of them are said to have been in use for more than thirteen centuries. The longest extends for over 70 kilometers and the deepest is 400 meters below the surface.”

Iran : Rebirth of a Timeless Empire,
1976, p. 43,

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Qanats : Subterranean Water and Delivery Systems

Polybius, Roman Historian, ca. 200 BC, speaking of Media, present-day Kurdistan, now within the borders of southeastern Turkey:

“In this tract of country there is no water appearing on the surface, though there are many subterranean channels which have well-shafts sunk to them, at spots in the desert unknown to persons unacquainted with the district.

A true account of these channels has been preserved among the natives to the effect that, during the Persian ascendancy, they granted the enjoyment of the profits of the land to the inhabitants of some of the waterless districts for five generations, on condition of their bringing fresh water in; and that, there being many large streams flowing down Mount Taurus, these people at infinite toil and expense constructed these underground channels through a long tract of country, in such a way, that the very people who now use the water are ignorant of the sources from which the channels are originally supplied”.

Polybius X.28

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Qanats : Subterranean Water and Delivery Systems

Compare the foregoing the to United States and Other Pioneer Nations

The Homestead Act, US Federal Law enacted in 1862.

“The Homestead Act was a United States Federal law that gave freehold title to 160 acres (one quarter section or about 65 hectares) of undeveloped land in the American West. The person to whom title was granted had to be at least 21 years of age, white, and free, to have built on the section, and to have farmed on it for 5 years, and to have a house on it that was at least 12 by 14 feet (3.6 x 4.3 m) in size. The Act was signed into law by President Abraham Lincoln on May 20, 1862. Eventually 1.6 million homesteads were granted and 270 million acres was privatized between 1862 and 1964. A total of 10% of all lands in the United States.”

The Homestead Act
Wikipedia

The Homestead Act of the United States was afterwards adopted and adapted in other nations settled by pioneer effort such as Canada and Australia.

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Qanats : Subterranean Water and Delivery Systems

Hans Wulff, Author: *The Traditional Crafts of Persia*

“The qanat works of Iran were built on a scale that rivaled the great aqueducts of the Roman Empire. Whereas the Roman Aqueducts now are only a historical curiosity, the Iranian system is still in use after 3000 years and has continually been expanded. There are 22,000 qanat units in Iran, comprising more than 170,000 miles of underground channels.”

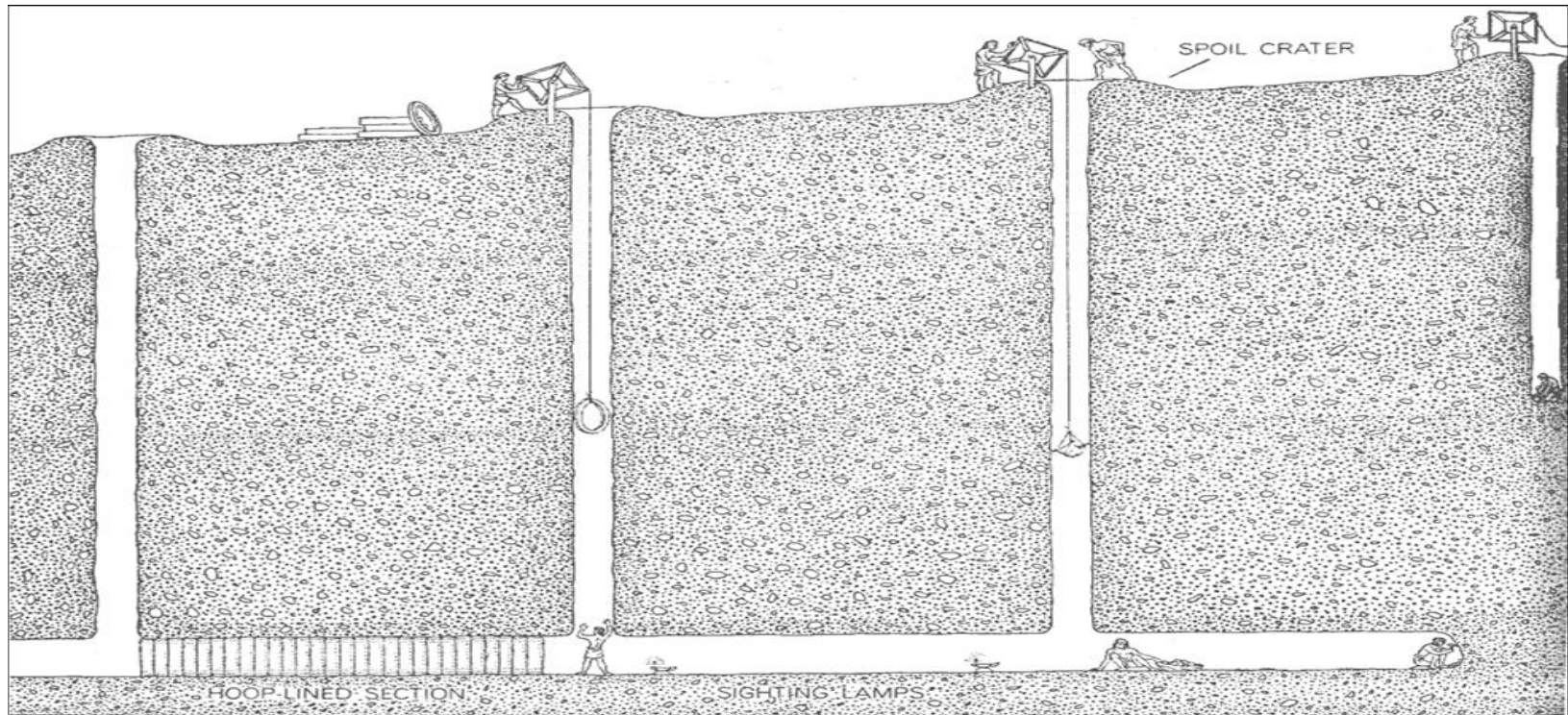
Scientific American, April 1968, p. 94

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Qanats : Subterranean Water and Delivery Systems

Qanat Systems Providing Water

Typically 10 km of subterranean horizontal canal, at a gradient between 1000:1 and 1500:1, with hundreds of vertical shafts, comprise a Qanat unit of which a short section is shown below. Clay hoops are used by the qanat makers for support where they meet soft soil. The water in the soil at the foothills of mountains percolates into the canal and is thereby carried downstream by gravity to the village or town that is fed by the Qanat.

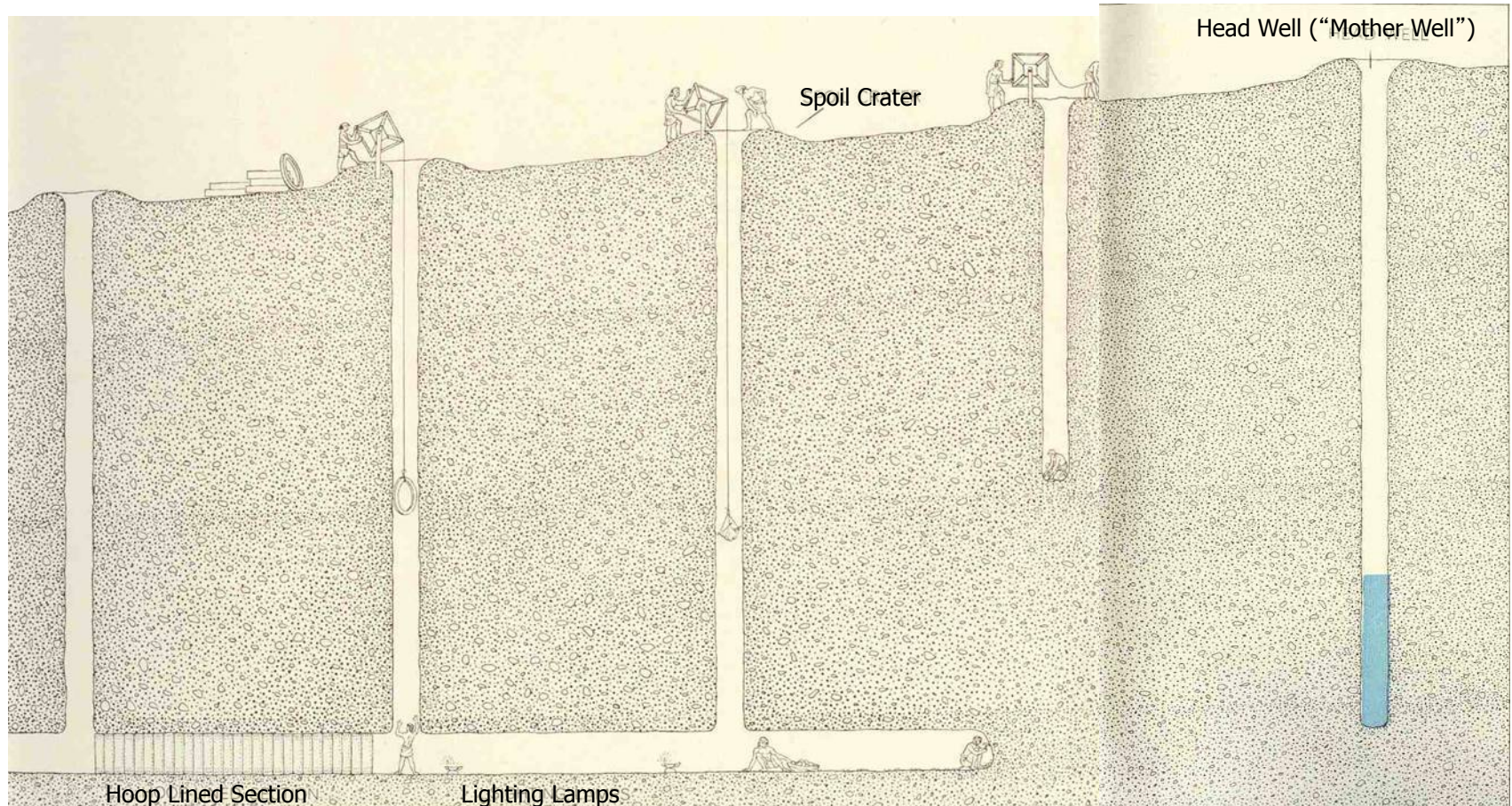


Drawing : Hans Wulff

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Qanats : Subterranean Water and Delivery Systems

A section of a qanat unit. Hundreds of vertical shafts, typically with a mother well a few hundred feet deep and a long canal, typically 10 km, comprise a qanat unit.



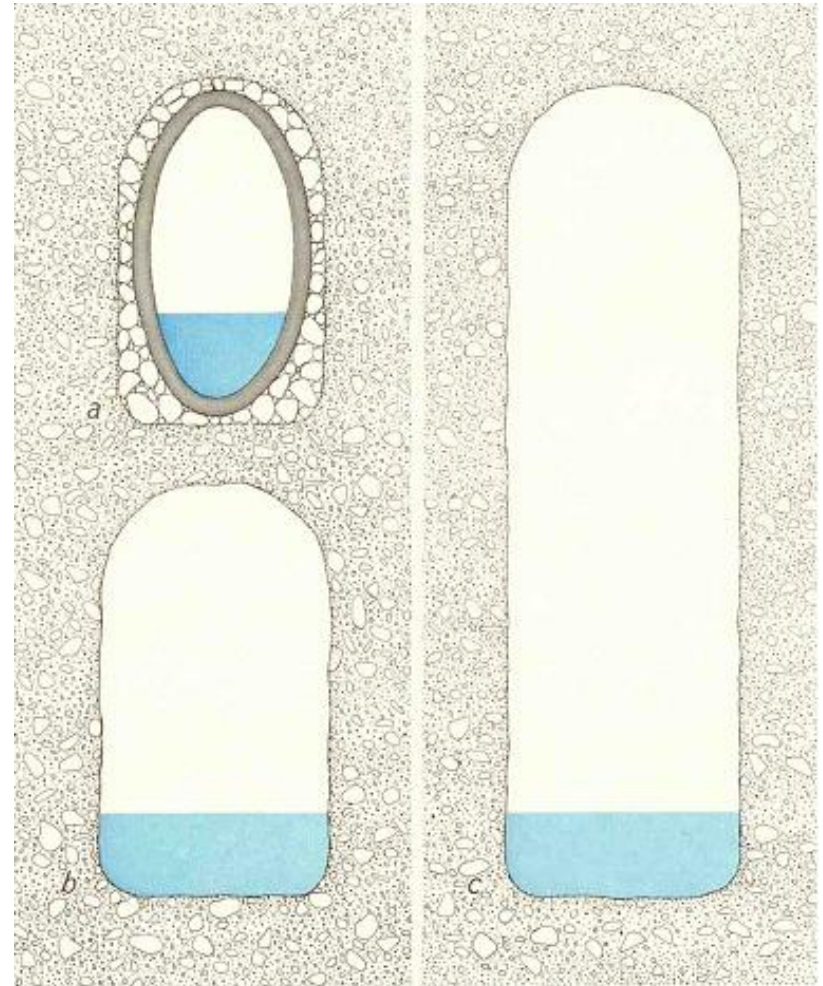
Drawing : Hans Wulff

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Qanats : Subterranean Water and Delivery Systems

Alternative cross sections exist for the tunnels of qanat systems.

Although for the water the tunnel would not need to be high, it has to be high enough to allow passage of qanat technicians and laborers during construction and thereafter, maintenance.



Drawing : Hans Wulff

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Qanats : Subterranean Water and Delivery Systems

Clay hoops are lowered into the tunnel and installed where the soil is soft or the qanat technicians see a possibility of cave-in.



Photo : Hans Wulff

Major Steps in Qanat Construction

- 1) The expert, a qanat engineer, surveys the site, the foothills of a mountain nearby, to determine the position of a *gumaneh* or guess-work head well, where rainwater or snow-melt water has seeped into the soil and accumulated deep within the ground. This he does based on observation during fall or winter, the position and curvature of alluvial fans, of vegetation, of soil etc. and his intuition.
- 2) The head well, with a diameter of about three feet, is then dug down until the team either reaches the top of the water-bearing layer within the soil (called *abdeh*), or determines they have gone deep enough and the location was dry.
- 3) Upon reaching water soaked soil, they dig more carefully and slowly, removing water that accumulates along the way, making the well deeper and deeper until they reach the bottom of the water-bearing layer of soil.
- 4) The expert qanat engineer has to observe the rate and direction of water seepage into the trial well, over a period of days in the process of digging, to tell whether they have actually reached an aquifer, water-bearing layer, or they are just drawing modest amounts of water leaking from other sources such as rock or clay formations nearby. The latter is called mere 'earth sweat' (*aragh-e zemin*) and is of no value.
- 5) At the discretion of the expert engineer more wells are dug to ascertain the above findings or to find the aquifer if not yet found. The choice of the head well among these is a balancing act of one that has reasonably high flow of water into it from the surrounding soil, yet is not so deep so to be nearly level with the oasis in need of water, for the horizontal canal generally should have a gradient between 500:1 to 1500:1. If felt appropriate by the expert, the various trial wells are connected together.

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Qanats : Subterranean Water and Delivery Systems

Major Steps in Qanat Construction - Continued

- 6) A rope is lowered into the head well to reach the water level. The rope is marked at the earth level. This is length A.
- 7) In the direction of the oasis to be fed with qanat water, a spot is marked about 50 yards away from the head well. The second well is dug there. To account for the drop in elevation, over the 50 yards, a rope is stretched between the two wells. At the second well, whose opening is lower, the rope is held up, and using a level, made as horizontal as possible. From there the drop in elevation down to the opening of the second well is measured. This is length B. The second well is then dug to a depth of A-B (plus a slight distance for gradient).
- 8) To connect two wells under ground, that is, to find the right bearing to dig the horizontal canal, the rope stretching from the head well and across the opening of the second well serves as a guide. The rest is direction of any noise issuing from the other well and intuition.
- 9) Once a few wells are made at the foothill, it is time to decide where at the oasis the qanat will reach surface level to go along distribution channels to homes and farms. This opening is fortified with stone blocks.
- 10) From this opening at about 300 yard intervals in direct line of sight toward the foothill wells guide wells are dug. To keep things straight, sighting is done using two lamps. These guide wells help ensure the proper gradient in the canal below. Since for every kilometer there is just one meter drop, and there is some 20 wells (of 50 yards spacing) in a kilometer, the 5 cm or so elevation drop for each well is not always discernible when digging to depths of a few hundred feet and more. The guide shafts enable the technicians to make sure of the slope.
- 11) Then the distance between these guide wells is filled with wells at about 50 yards and the horizontal canal underneath them is dug.

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Qanats : Subterranean Water and Delivery Systems

Persepolis' Qanat System

Arial photo showing today's qanat network around Persepolis. Note the dotted lines to the right, representing the craters that form around qanat shafts. Several qanat units supply Persepolis with water.



Photo : Hans Wulff

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Qanats : Subterranean Water and Delivery Systems

Hans Wulff:

“Other regions of the world with so little rainfall are barren of attempts at agriculture. Yet Iran is a farming country that not only grows crops for its own food but also manages to produce crops for export . . . It has achieved this remarkable accomplishment by developing an ingenious system for tapping underground water.”

Scientific American, April 1968, p. 94-5

“An eminent authority on groundwater is convinced that the *qanat* system undoubtedly is the “most extraordinary method to develop groundwater”.”

The Traditional Crafts of Persia, op. cit. p. 251

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Qanats : Subterranean Water and Delivery Systems

Qanats constructed in Egypt by Iran ca. 500 BC, and in operation to-day

Hans Wulff:

“Recent translations of some Egyptian inscriptions revealed the nature of some irrigation work carried by the Persian general Scylox in the oasis of Kargha after Darius I had conquered Egypt. The inscription says *inter alia* that Scylox applied the Persian method of irrigation to bring water to the oasis in underground conduits. From then on the Egyptians were no longer hostile toward the conquerors, built a temple of Ammon and conferred the title Pharoah on Darius. Remnants of these *qanat* that still function have been investigated, and it appears that they tap the underground water table of the Nile and lead the water into the oasis, which is a depression 100 miles away from the Nile.”

*The Traditional Crafts of Persia:
Their development, technology, and influence on
Eastern and Western civilizations, 1966, p. 250*

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Qanats : Subterranean Water and Delivery Systems

Qanats were spread from Iran to most of the world. To-day as the competition for meager water resources heats up further between Israel and its neighbors, qanats can again be employed as a means of promotion of peace in the Middle East:

Afghanistan

Pakistan

China

Southern Republics of the former USSR

Iraq

Syria

Arabia

Yemen

Oman

Egypt

Libya

Morocco

Spain and South America

Sicily

Luxembourg

Germany

. . .

. . .

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Qanats : Subterranean Water and Delivery Systems

Paul Ward English of the University of Texas, Austin, lived in the hills near Kerman, Iran with his wife for a few years in the 1960s and studied the settlements in the Kerman basin. Realizing that qanats were really the basis of such settlements led him to a detailed study of qanats. The following is from his survey of scholarly research on qanats. The region he refers to below as “the highlands of western Iran, northern Iraq and eastern Turkey” constitutes ancient Media, of whose qanat system Polybius reported earlier, which is present-day Kurdistan. Persians who spoke Arabic or persianized Arabs spread this qanat system in the centuries after the advent of Islam, thus for that later period of history qanats came to be associated with Arab culture.

“Qanat technology apparently originated in the highlands of western Iran, northern Iraq and eastern Turkey some 2500 years ago . . .

The core area of qanats then lies in the realm of the Persians whose language is rich in words relating to qanat technology and where qanat are very old, very numerous, and construction techniques are fully developed . . . In modern times, most of the major cities in Iran including Tabriz, Qazvin, Saveh, Tehran, Yazd, and Kerman rely on qanats for domestic and irrigation water and chains of wells radiate outward from each of them . . .

The first diffusion of qanats out of this core area occurred in the Achaemenid period when the Persians established an empire extending from the Indus to the Nile. To the west, the Persians carried qanat technology across the Fertile Crescent to the shores of the Mediterranean and southward to Egypt and Saudi Arabia. In the Iraqi foothills of the Zagros, qanats water the cities of Kirkuk and Arbil.

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

The Spread of Qanats to Egypt and Arabia

In Egypt *qanats* built during the Persian occupation (525-332 B.C..) are found in the Kharga Oasis and at Matruh. Beadnell measured one of these tunnel-wells, which at Kharga are dug into soft sandstones, and found 150 shafts on a line 3,200 meters long; he estimated that 4,875 cubic meters (about 11,000 tons) of rock had been removed from that tunnel and its shafts alone. Agricultural colonies in the early 1900's cleared some of the ancient Kharga *qanats*, which had been choked with debris for more than a millennium, and they still supplement surface water supplies today. At Matruh *qanats* were driven beneath consolidated sand dunes into limestone and were closed with cement caps. *Qanat* construction in solid rock is rare elsewhere in the Old World.

The Persians also introduced qanats into Arabia in the fifth century B.C. and they are still used in the Hijaz, in the mountains of Yemen, along the Hadhramut, in Oman, and at the Al Kharj oasis north of Dhahran. Underground conduits are found in the Wadi Fatima west of Mecca and similar channels carry water to this holy city from ain Zobeida to the southeast. Qanats also carry water to several quarters in Medina from a spring at Ain Zarga south of the city. The mountains west of San'a have qanats as do some districts in the central highlands of Najd. Qanats are most numerous in Oman where they are called aflaj; in Yemen and the Hadhramut they are called felledj. At Al Kharj the qanats are specifically attributed to Persian workmanship, as the name of a nearby ridge, Firzan, attests.

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

The Spread of Qanats East and West of Iran

East of Iran, *qanats* are used in Afghanistan, Central Asia, and Chinese Turkestan (Sinkiang). Here, *qanats* are called by their Persian term (*kariz*) rather than the Arabic *qanat*, yet whether this technology spread eastward during the Achaemenid diffusion or at some later period is uncertain. In Afghanistan *qanats* are a major source of irrigation water in the south and southeast, especially around the city of Qandahar. In Pakistani Baluchistan, approximately two-thirds of the water in the city of Quetta is supplied by *qanats*, which also irrigate some 90,000 acres of land in the vicinity. *Qanats* were apparently used in western China as early as the second century B.C., yet Huntington claims that they were not used in the Turfan Basin, which has one of the most extensive *qanat* systems in the world, until the eighteenth century. In modern times approximately 40 per cent of the people in this region depend for water on *qanats* dug by imported Turki laborers.

In a second major diffusion, *qanat* technology spread with Islam and the Arabs across North Africa into Spain, Cyprus, and the Canary Islands in the seventh and eighth centuries A.D. In North Africa *qanats* (here called *fuqara*) are widely distributed, though having been built and maintained by Negro slave specialists, new constructions are rare. In Libya they are found in the Kufra oases and in the Fezzan, particularly at Ghadames. In Tunisia *qanats* have been reported north of the Chott Djerid and in Algeria, on the borders of the Tademait Plateau in the Touat and Tidikelt districts south of the Great Western Erg. In Morocco *qanats* are called *khettara* or *rhattara* and are used on the northern slopes of the Atlas, particularly around the city of Marrakech, and south of the Atlas in the Tafilalt. It is in these last three regions, in the Tademait district of southern Algeria, near Marrakech, and in the Tafilalt of Morocco, that *qanats* reach their greatest development outside the Persian core area.

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

The Spread of Qanats to North Africa

Qanats were introduced into the Touat and Tidikelt districts of Algeria several centuries before the Arab conquest by Jews or Judaized Berbers fleeing from Cyrenaica during Trajan's persecution in A.D. 118. These refugees were the first Jewish colonists in the Tademait region, establishing their capital at Tamentit south of Adrar. Having absorbed the fundamentals of *qanat* technology during their long stay in Persian territory, first in Palestine and later in Cyrenaica, these Jews introduced *qanats* into the Western Sahara. In this region today, more than 1,500 kilometers of *qanat* tunnels can be found . . .

Qanats were first built in Marrakech in the eleventh century A.D. during the reign of the Almoravides. Today some 85 *qanat* systems are found on the Haouz plain, 40 of which are functioning and carry water to the Most of these systems are rather short; the largest lie to the south of the city, are 4-5 kilometers long, and reach a maximum depth of 70 meters. In the Tafilalt, *qanats* are most numerous in the oases of Tadrha, Ferkla, Jorf, and Siffa south and west of Ksar es Souk. Margat found 273 *qanats* in this region, 145 in good condition, providing 1,100 liters of water per second to irrigate some 850 hectares of palm groves.

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

The Spread of Qanats to Europe

Qanat technology spread into Europe with Arab culture; they were used marginally in the Spanish province of Catalonia and at Madrid and are still a major source of water in Cyprus and the Canary Islands. Recently, abandoned *qanats* were discovered in Central Europe, in Bavaria and Bohemia, though when or how *qanats* spread into that region is unknown. In Cyprus the total flow from all *qanats* amounted to 9.25 billion gallons in 1950 with an additional capacity of 1.85 billion gallons then under construction. In the Canary Islands, Tenerife and Gran Canaria are literally dotted with *ghlerias*, as *qanats* are called here and in Latin America.”

- Paul Ward English

The Origin and Spread of Qanats in the Old World

Proceedings of the American Philosophical Society

Vol. 112, No. 3, June 1968

Expression of Beliefs and Values in Material Culture :

Major Crafts and Public Works

The Destruction of Scientific Works and Other Records

Ibn Khaldun:

“Among the Persians, the intellectual sciences played a large and important role, since the Persian dynasties were powerful and ruled without interruption . . . However, when the Muslims conquered Persia and came upon an indescribably large number of books and scientific papers, Sa’d b. Abi Waqqas [who led the invading hordes] wrote to ‘Umar b. Khattab [Caliph, ca 640 AD], asking him for permission to take them and distribute them as booty among the Muslims. On that occasion, ‘Umar wrote him : “Throw them into the water. If what they contain is right guidance, Allah has given us better guidance. If it is error, Allah has protected us against it.” Thus the Muslims threw them into the water or into the fire, and the sciences of the Persians were lost and did not reach us.”

- Ibn Khaldun, *The Muqaddimah : An Introduction to History*,
Translated from the Arabic by Franz Rosenthal,
1958, Vol. 3, Ch VI, Section 18, p. 113-114

Hans Wulff:

“The governor of Khorasan, ‘Abdullah b. Tahir (828-844 A.D.), found that the “traditions of the Prophet” did not refer to the qanat system and the distribution of water, and asked the jurists of the province to write a book on the subject. Known as “Kitab-e Quniy,” it was still in use during the eleventh century. A technical treatise written about 1000 A.D. has fortunately survived to our day and has been republished recently.”

The Traditional Crafts of Persia, 1966, p. 251

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Qanats : Subterranean Water and Delivery Systems

Where civilizations were built was based on their source of water. Most, except Iran, were attached to a river system.	
Civilization	Source of Water
Egypt	The Nile
Mesopotamia	Tigris & Euphrates
Indus Valley Civilization	The River Sind
Iran	Not a city-state civilization. Not attached to a river system. Over 20,000 Qanat systems, supplying tens of thousands of settlements.

VI. The Building of Monuments

“Even though”, in the words of the great philosopher Ibn Khaldun, “**d**estruction is easier than **con**struction”

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Ancient Architecture



Remains of Persepolis, ceremonial capital of Iran ca. 500 BC - destroyed by Alexander ca. 323 BC

Palace area : 1.4 million square feet, complete with integrated sewage system and water supply

Photo : Time Life

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Ancient Architecture

How the 100-ton, 65 ft high, 7-foot diameter columns of Persepolis were carved out of rock, ca. 500 BC. First, trenches get chiseled out.

In similar fashion the walls were carved out, and according to archeologist Roman Ghirshman, polished to a mirror finish.

“Near a royal residence, laborers quarry sandstone or limestone for construction by carving rectangular blocks from living rock. First, deep parallel trenches are cut and holes are bored in perpendicular rows. Into the holes workmen drive foot-long wedges and soak them with water, causing the wood to swell and split the rock. Finally, the wedge-and-water process is repeated in the trench bottoms to free each block from the rock bed. At the rear, several men are shaping a piece of extracted stone into a column segment.”

Jim Hicks
The Persians, 1962, p. 64

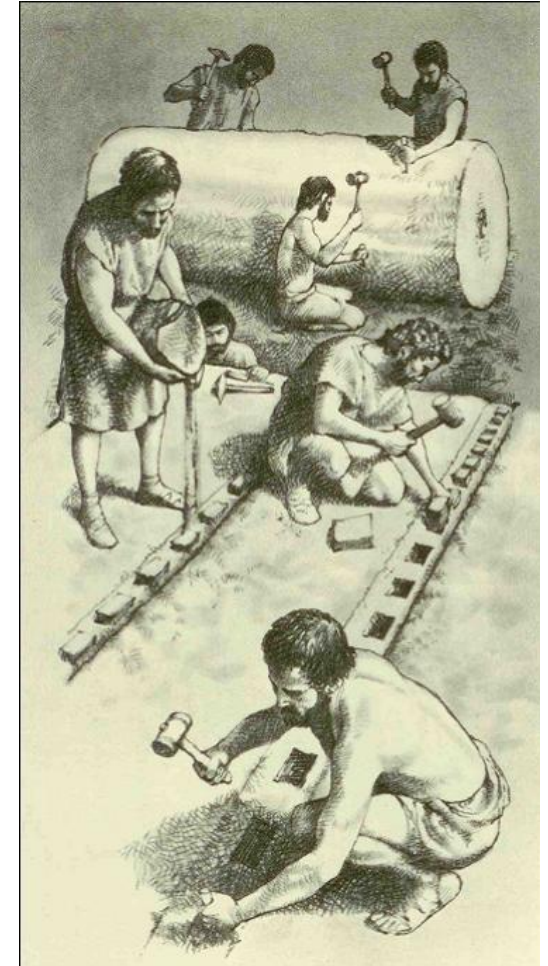
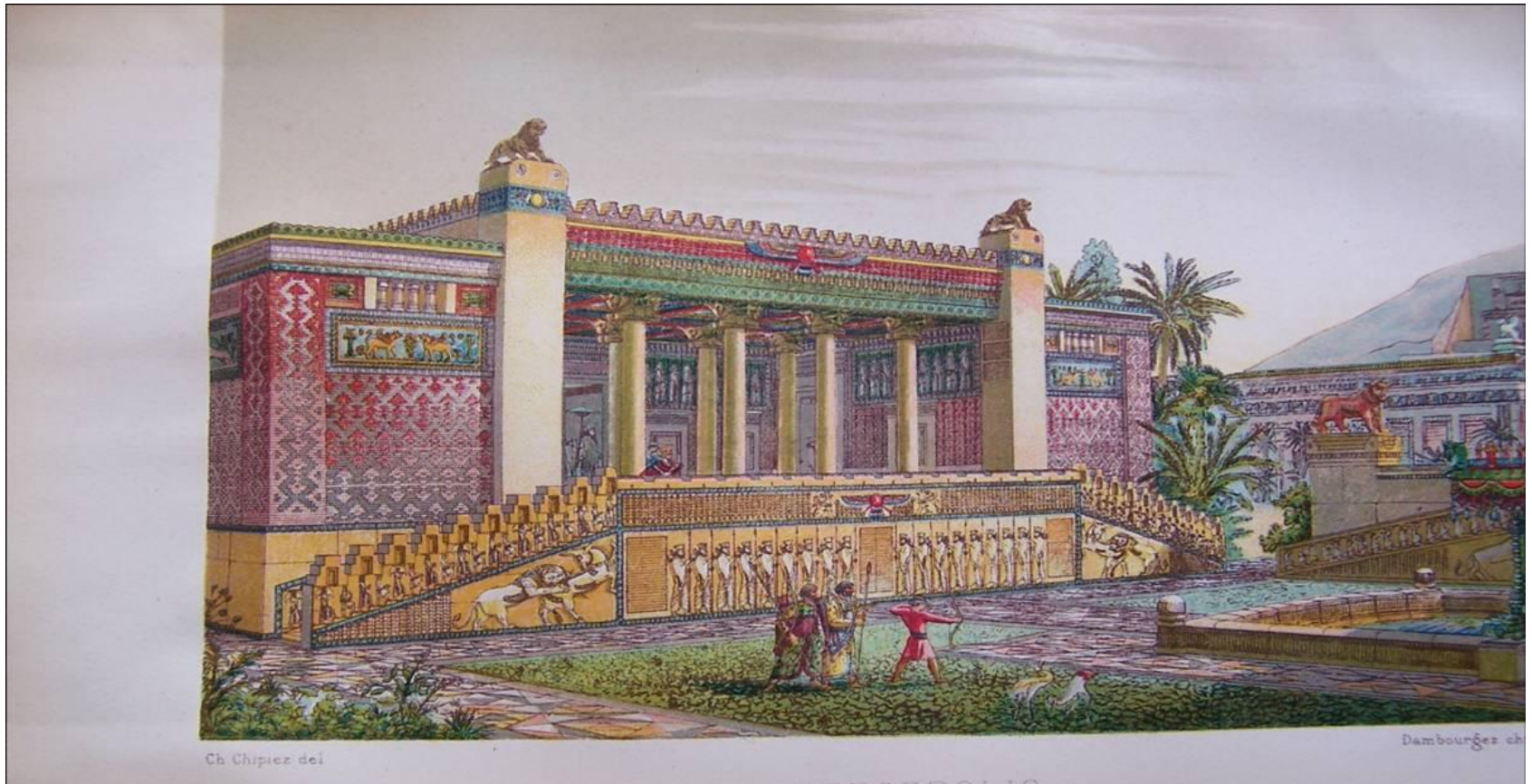


Photo : Time Life

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Ancient Architecture



Palace of Darius at Persepolis : Art Historians' Restoration
– Georges Perrot and Charles Chipiez
History of Art in Persia, 1892

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Even Though **D**estruction is Easier Than **C**onstruction



Arial View : Reception Hall of Khosrow at Ctesiphon

Photo : Global Heritage Fund

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Even Though **D**estruction is Easier Than **C**onstruction



Reception Hall of Khosrow at Ctesiphon

Photo : Atlas Tours

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Even Though **D**estruction is Easier Than **C**onstruction



Reception Hall of Khosrow, Ctesiphon, as it was in the 1880s

Photo : UC Berkeley

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Even Though **D**estruction is Easier Than **C**onstruction

Ibn Khaldun (ca. 1400 AD) on the foregoing structures:

“One should see with one’s own eyes the reception hall of Khosrow, that powerful achievement of Persian architecture. Ar-Rashid intended to tear it down and destroy it. He could not do so for all his trouble. He began the work but then was not able to continue. The story of how he asked Yaha b. Khalid for advice in that affair is well known. It is worth noting that one sovereign power was able to construct a building that another was not able to tear down, even though destruction is much easier than construction. That illustrates the great difference between the two sovereign powers.” –

op. cit. Ch. II, Section 16, p. 356

During the course of history, some seeking fame, fortune or power have tried reaching that through construction, while others through destruction. Ibn Khaldun contrasts the effort required for reaching those goals via destruction vs. construction by the attempts of Harun ar-Rashid at destruction, which was typical of other Caliphs. One of the greatest Caliphs, Harun ar-Rashid is known in the West through the Thousand and One Nights, and more recently during the Gulf wars by the famous hotel in Baghdad named after him.

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Even Though **Destruction** is Easier Than **Construction**

Ibn Khaldun:

“Another confirmation of our theory is the fact that we find that later sovereign powers are unable to tear down and destroy many great architectural monuments, even though destruction is easier than construction . . .

This is what happened to the Arabs with regard to the Reception Hall of Khosrow. Ar-Rashid had the intention of tearing it down. He sent to Yahya b. Khalid, who was in prison, and asked him for advice. Yahya said “O Commander of the Faithful, do not do it ! Leave it standing ! It shows the extent of the royal authority of your forefathers who were able to take away the royal authority from the people who built such a monument.” Ar-Rashid, however, mistrusted Yahya’s advice. He said that Yahya was motivated by his affection for the Persians and that he (ar-Rashid) would indeed bring it down. He started to tear it down and made a concerted effort to this effect. He had pickaxes applied to it, and he had it heated by setting fire to it, and he had vinegar poured upon it. Still, after all these efforts he was unable to tear it down. Fearful of the disgrace involved in his inability to demolish the monument, he sent again to Yahya and asked him for advice, whether he should give up his efforts to tear it down. Yahya replied: “Do not do that! Get on with it, so that it may not be said that the Commander of the faithful and ruler of the Arabs was not able to tear down something that non-Arabs had built.” Thus, ar-Rashid recognized his disgrace and was unable to tear it down.”

op. cit. Ch. IV, Sections 4 and 5, p. 242

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Even Though **D**estruction is Easier Than **C**onstruction

“Part of the skeleton of Khusrau’s enormous throne hall still stands today, and the complete façade was preserved as late as 1880, when some of it collapsed as a result of a disastrous flood The great parabolic vault of the Taq-i Kasra is nearly 35 meters high with a span of over 25 meters and a length of nearly 50 meters. It is the largest example of such an arch, built without centering, in any façade in the world.”

Georgina Herrmann,
*The Making of the Past :
The Iranian Revival, 1977*

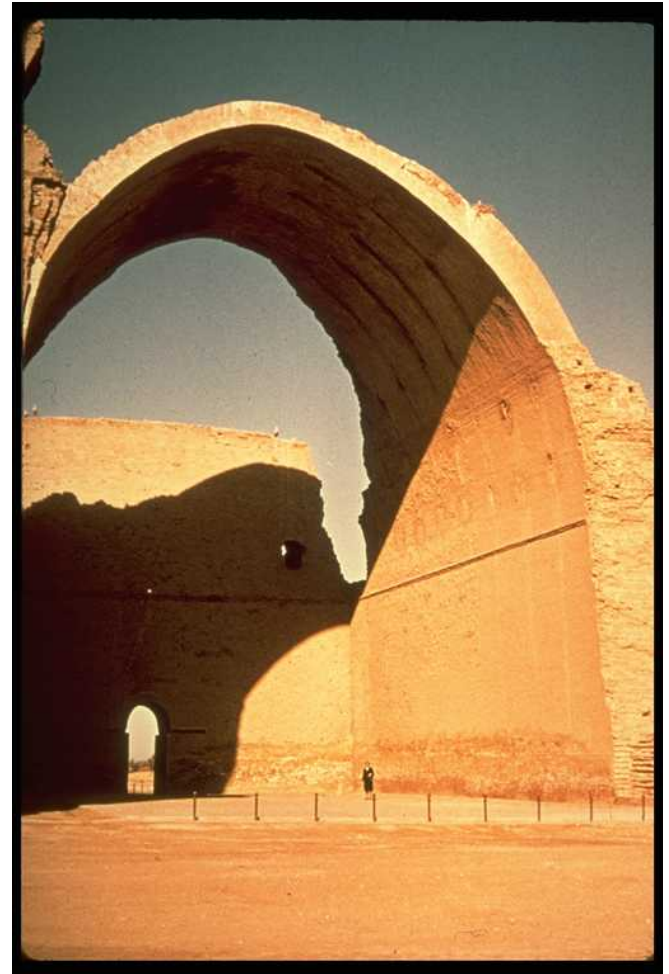


Photo : UC Berkeley

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Origins of European Kingship

Major institutions and traditions from Iranian culture came to be part of the West through the intermediary of Greece and Rome. In the transition the knowledge of their source was lost in the popular tradition.

“The Diadochi, heirs to Alexander, became in their turn the prototypes of the Roman Caesars, through whom the European conception of the sovereign or supreme emperor thus ultimately derives from the Persian Great King.”

- J. H. Iliffe, Director of the City of Liverpool Museums,
Persia and the Ancient World in
The Legacy of Persia, 1953, p. 7

“The Sasanian monarch¹ lived in a court whose luxury and splendour were unsurpassed by that of any dynasty in the world's history, in which connexion Diocletian wore robes copied from those of the Sasanian monarch and the rules of procedure at his court were taken from the same source.”

- Sir Percy Sykes:
History of Persia, 3rd Edition, 1930
Vol. 1, p. 465

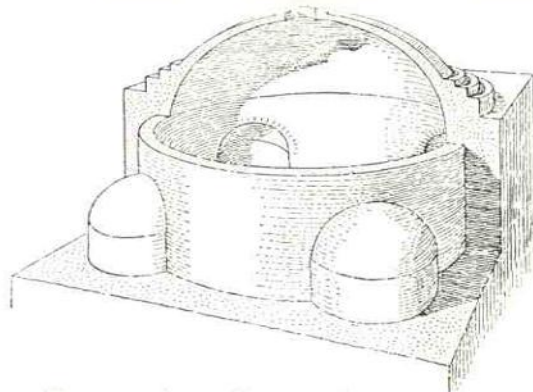
¹ Ruling dynasty of Iran 224-635 AD

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

The Art and Science of Dome Interface

Likely etymology
of squinch :

sekonj, or three
corners (of the
interface), in
Persian.



Roman Domed Rotunda



Iranian Dome on Squinch

Depiction :
Arthur Upham Pope

“With regard to the vault or dome placed over a square plan, the principal problem is how to manage a transition from the square below to the circle above. For centuries this problem baffled the very competent Roman engineers, who did not provide an attractive or even assured solution. The earliest solution was reached by Persian engineers and masons who realized that the answer required the development of a third section, a zone of transition between the square chamber below and the round dome above . . . The history of this device, the squinch, is essential to the history of Islamic architecture.”

Arthur Upham Pope,
Introducing Persian Architecture, 1976, p. 104

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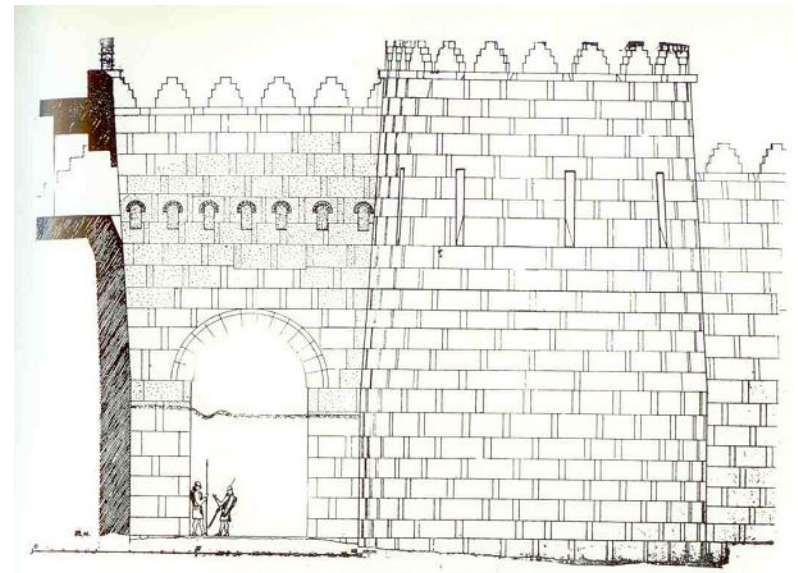
Interface Between Heaven and Earth

Many buildings and monuments were destroyed in the various invasions Iran has suffered, but in some cases there are enough records to piece together their history, as describes Arthur Upham Pope:

“We can fill the gap a bit with evidence left by documents, traditions and sundry artefacts. These yield us some understanding of a remarkable Sasanian building: The Takht-i Taqdis, on a sacred mountaintop in northwest Persia, a point of contact between heaven and earth, the reputed birthplace of Zoroaster and the most sacred shrine in the Sasanian world. Formerly known as Shiz or Ganzaca, it is today known as Takht-i-Suleiman, the Throne of Solomon . . . It is at least possible that this building provided the initial concept of the Castle of Holy Grail. It is especially significant for the history of Persian architecture because it expressed so specifically the ancient Persian theory of the function of the throne as intermediary between heaven and earth . . .

The whole building, described by many Arabic, Persian and Byzantine sources, was set on rollers so that it could be turned to correspondence with the rotating sky. Even more significant was the reported apparatus for creating mock storms; machines for lightning, thunder and rain, to induce the outer heavens to send life-giving storms to replenish the earth.”

- Arthur Upham Pope, *op. cit.* 1976, p. 36



Takht-e Suleyman

Depiction :
Arthur Upham Pope

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

A Wall as Defensive Barrier Extending into the Sea

The Great Wall of Gorgan was built, ca. 500 AD, to protect the civilized, farming communities to the south against the raids of the Hephthalites, or White Huns, in the north. It is roughly 80 miles long, with 33 forts and innumerable kilns along its length. Remnants of it have been found under the water in the Caspian Sea. The great poet Ferdowsy relates in the national epic of Iran, *Shahnameh*, Epic of the Kings, written ca. 1000 AD, that it was begun from within the sea, some five hundred years earlier, using Sarouj. Thus at around 500 AD the technology for building walls within water that would hold firm had been deployed in Iran, a fact that David Stronach, Professor of Archeology at UC Berkeley affirms by citing the example on the western side of the Caspian, of Derbent, in Dagestan. *Derbent* denotes closed gate or blocked passage, in Modern Persian *Darband*. The Wikipedia defines Sarouj (under the entry Yakhchal) as being “composed of sand, clay, egg whites, lime, goat hair, and ash in specific proportions, and which was resistant to heat transfer. This mixture was thought to be completely water impenetrable.”

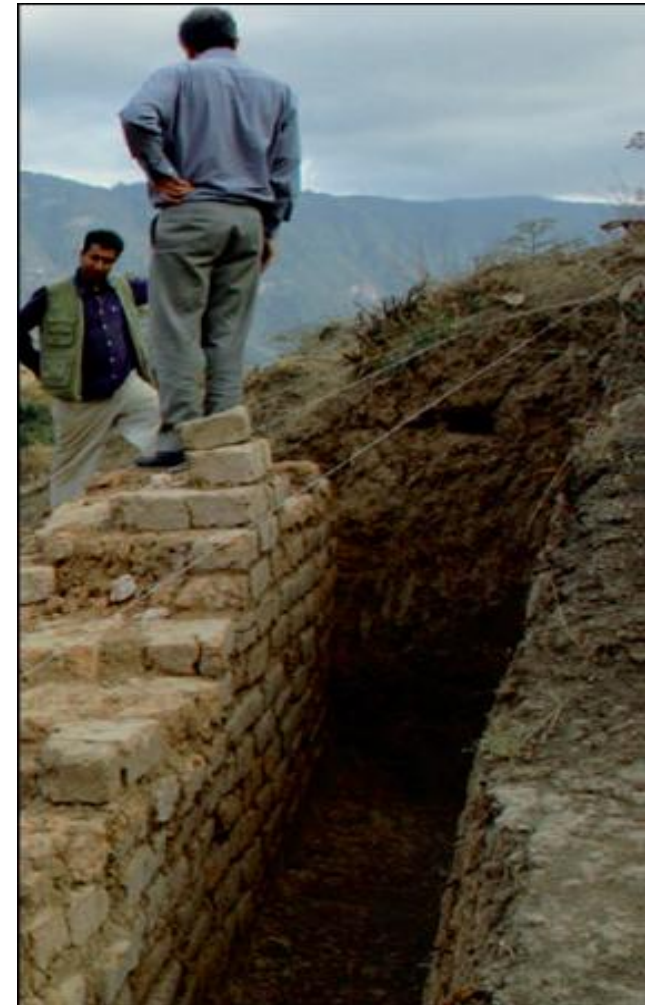


Photo : Current World Archeology

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

A Wall as Defensive Barrier Extending into the Sea

“It is longer than Hadrian’s wall and the Antonine wall together. It is over a thousand years older than the Great wall of China as we know it today. It is of more solid construction than its ancient Chinese counterparts. It is the greatest monument of its kind between central Europe and China and it may be the longest brick, or stone, wall ever built in the ancient world – and yet few have ever heard of it. This wall is known as ‘The Great Wall of Gorgan’ or ‘The Red Snake’. An international team of archeologists has been at work on the snakelike monument and here they report on their findings.”

- *Current World Archeology*, No. 27,
Feb.-March 2008

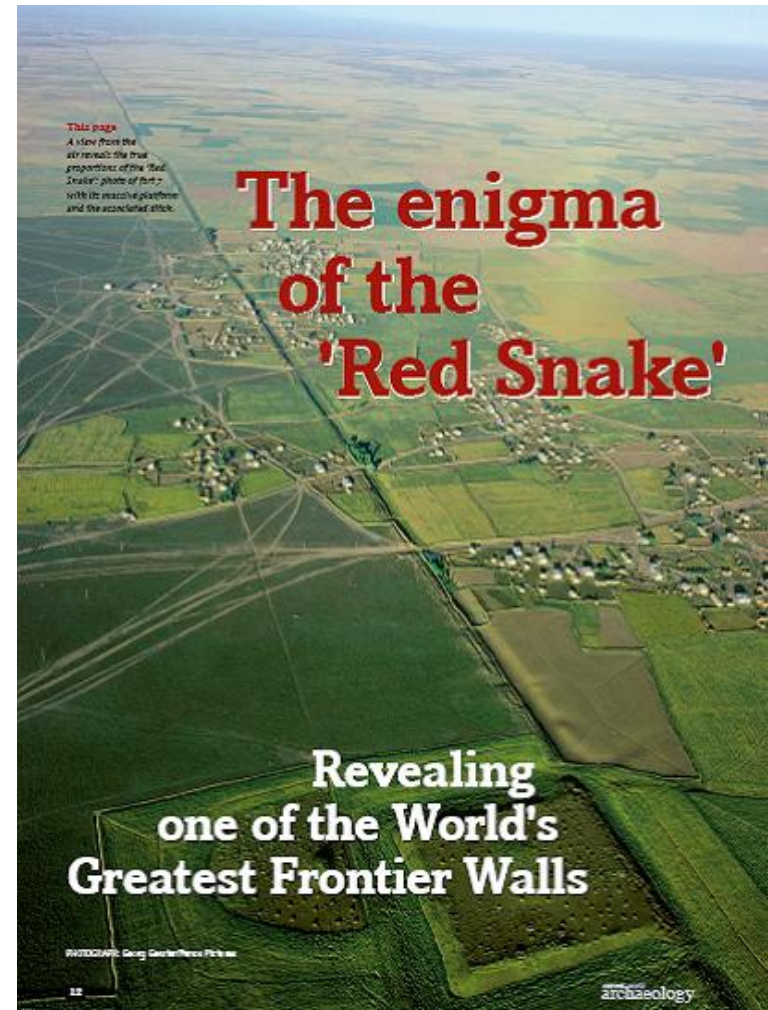


Photo : Current World Archeology

VII. Astronomy and Astrology

Astronomy and Astrology

Both astronomy and astrology had been practiced in Sumer and then Babylon, as well as Egypt and China, long before the Persians established the First World Empire, ca. 540 BC, under Cyrus the Great. But a few major transformations took place under the Persian Empire as a result of the tenets of the Zoroastrian religion which continue to our day, notably natal and mathematized astrology. We do not have much in the way of records of astronomical knowledge in Iran prior to the Middle Ages, but since astrology depended on astronomy and was widely practiced, and from other evidence, it is a given that the practice of astronomy as a science was quite well established.

Before Persian dominion over Babylon, astrology was concerned with events in the course of the life of a nation, or prediction of cosmic events. Near Eastern religion, as exemplified then by Israelite religion (notwithstanding their other major differences with it), was more concerned with the life of the nation than the individual : so was astrology. Under the Persians astrology became concerned with the course of the life of the individual, and out of that emerged natal¹ astrology. This was due to the stress that Zoroastrianism places on the freedom of the individual, as explains William G. de Burgh:

“Iranian religion was strongly ethical . . . In its recognition of the worth of secular culture and in its direction to end of individual rather than national salvation, the religion of Iran differed from that of Israel.”

The Legacy of the Ancient World, 1947, p. 39-41

¹ Natal : Birth-oriented, individualized

Expression of Beliefs and Values in Material Culture :

Major Crafts and Public Works

Astronomy and Astrology

Michael Baigent:

“The period of Persian rule brought about an important advance in astrology – the adoption of mathematical discipline . . .

The search for regularity in stellar movements continued with the discovery of the *synodic periods* of the planets. The synodic period is the period between consecutive conjunctions of the planet with the Sun, as seen from the earth. Additional to this was the concept of the *sidereal period*, which is the length of time taken by a planet to pass through the entire twelve signs of the zodiac and return to its starting point. These in turn led to the formulation of larger planetary periods which were used for predicting future movements. The period used for Saturn, for example, was fifty-nine years, being made up of two sidereal periods – each of twenty nine and a half years – or fifty-seven synodic periods. Similar accurate periods for all the planets were fixed early in the Persian era, and together with mathematical techniques, this knowledge was used to calculate future planetary movements.

Around this time, too, the planets became established in zodiacal signs rather than in zodiacal constellations.

. . .

continued next slide

Expression of Beliefs and Values in Material Culture :

Major Crafts and Public Works

Astronomy and Astrology

Continuing from previous slide:

“Professor Van der Waerden, an expert on the early history of astrology, argues that just as there is a close connection between the classical Babylonian astrology of the Enuma Anu Enlil and the Babylonian polytheistic religion, there is also a corresponding relationship between the astrology based upon a natal horoscope and the monotheistic Persian religion, Zoroastrianism.

Natal astrology would not have arisen, argues Professor Van der Waerden, without a change in cosmological perspective. An important part of this new perspective, he believes, was supplied by Zoroastrianism. The basis of this religion is found in the writings of Zoroaster, which reveal a supreme god, Ahura Mazda, together with a concept of an individual immortal soul which has a free choice between good and evil. Professor Van der Waerden sees this doctrine as influencing the Greeks through Pythagoras and Plato. He writes “Persian myth had a decisive influence on the rise of birth horoscopy.”

The first known natal chart, from Babylon, dates from 410 BC.

. . .

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Expression of Beliefs and Values in Material Culture :

Major Crafts and Public Works

Astronomy and Astrology

Continuing from previous slide:

To what extent the Greek scholars were already studying and working in Assyria and Babylonia during the latter years of the native dynasties, and to what extent they continued to do so during the period of Persian domination is not known. But some scholars were certainly there.

A famous example – though he is unlikely to have been the first – was Pythagoras, who was born around 558 BC. And was thus nineteen years old when Cyrus took Babylon . . . While there he was taught for some years by a leading Zoroastrian priest, Zatatas, and was received into the highest esoteric mysteries of Zoroastrianism, which included, so the chronicles state, the doctrine for which Pythagoras is famous – that of the musical harmony of the universe.

It is recorded that, prior to his death in 399 BC, Socrates had encountered a ‘magus’ who had come to Athens. This astrologer made a number of predictions to Socrates, including that of his violent death. “

- Michael Baigent

From the Omens of Babylon : Astrology and Ancient Mesopotamia
1994, p. 173-77

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Astronomy and Astrology : Identity of the Magi

Charles Francis Potter, Antioch College, on the Identity of the Magi:

“When we turn to the New testament we find in the beginning of the first book, Mathew, an old story dear to the heart of all Christians which relates that the earliest visitors to the cradle of the infant Jesus were Wise men from the east who said they had seen his star and had come to worship him. The Greek word translated “Wise Men” is magoi or magi, which enables us to identify these dignified travelers as Zoroastrian priests. The same word is used in the first chapter of the book of Esther to describe the Seven Wise Men of Persia who “sat in the kingdom of Ahasuerus, that Zoroastrian king “who reigned from India even unto Ethiopia over a hundred and seven and twenty provinces”. No wonder early Christendom rejoiced at the story that priests of this ancient religion had brought to the feet of the Christ-child precious gifts of gold, frankincense and myrrh, perhaps thus expressing the hope that this babe was the Saoshyant, or Savior, that Zoroastrianism had long awaited.”

The Story of Religion as Told in the Lives of Its Leaders
1942, p. 97, 80

**VIII. Science, Mathematics and Medicine
from Iran and the Middle East to Europe**

Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Science, Math and Medicine from Iran to Europe

The Transition of Learning from the Middle East to Europe During the Crusades

Until the Crusades, Europe in the process of emerging from the dark ages knew little or nothing of Greco-Roman civilization. Europeans then came to acquire knowledge of learning when during the two centuries of the Crusades, despite the hostility between religious and political leadership in Islam and Christendom, friendships formed between people. Historians in Europe and the U.S. to-day, as a routine, refer to the Europeans at the time in Roman terms, as *the barbarians who overthrew the Roman Empire*. The Middle Eastern friends that Europeans gained during the Crusades taught this body of knowledge to them. This interaction took place between individuals. Europe as a society would need to go through a period of centuries of gestation and then this knowledge in various fields began to bear fruit. It was not until about 200 years ago that Europe had developed sufficiently on its own that it ceased using the works thus obtained. As an example, until the 1800s, the canon of Avicenna or Ibn Sina as he is known in Persian, was the main medical text in the universities of Europe. To take things to their origin, the Middle East had continued and taken up the works of the Greeks, who had acquired this body of knowledge, as Will Durant and others noted, from Sumerians, Babylonians and Egyptians in an earlier era of development.

Persian scientists in centers of learning wrote in Arabic that their works survive. The body of knowledge passed on to the Europeans from the Middle East, in its written form, was mostly in Arabic, and thus it came to be referred to as Arabian medicine or mathematics or science. As Ibn Khaldun informs us, Arab Caliphs had burned the books written in Persian. Ibn Khaldun next explains where the body of knowledge, that went from the Middle East to Europe, came from.

Expression of Beliefs and Values in Material Culture :

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Science, Math and Medicine from Iran to Europe

“The remarks of Ibn Khaldun are not in dispute”

– Richard N. Frye, Harvard University on the following passage by the philosopher of the development of history Ibn Khaldun, in his *The Golden Age of Persia*, 1975, p. 150

Ibn Khaldun:

“It is a remarkable fact that, with few exceptions, most Muslim scholars both in the religious and intellectual sciences have been non-Arabs . . . This has occurred in spite of the fact that Islam originated as an Arab sect with an Arab founder.

The reason for this is that, at the beginning, the Muslim sect knew neither learning nor crafts, owing to the simplicity of the nomadic life . . .

Now, as we have stated before, crafts are peculiar to sedentary peoples, the Arabs being of all men the least disposed towards them. Hence when these sciences developed in a sedentary environment the Arabs forsook them. The civilized sedentary people at the time were Persian, or those who were politically and culturally subject to them, and therefore had developed a skill in the sciences and the crafts owing to a long tradition of civilization under Persian rule.

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Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Science, Math and Medicine from Iran to Europe

Continued from previous slide, Ibn Khaldun :

Thus the founders of grammar were Sibawaih and, after him, al-Farisi, and az-Zajjaj. All of them were of Persian descent. They were brought up in the Arabic language and acquired knowledge of it through their upbringing and through contact with Arabs.

They invented the rules of grammar and made it into a discipline for later generations. Most of the *hadith* scholars who preserved traditions of the prophet for the Muslims also were Persians, or Persian in language and breeding because the discipline was widely cultivated in Iraq and regions beyond. Furthermore, all the great jurists were Persians, as is well known. The same applies to speculative theologians and to most of the Qur'an commentators. Only the Persians engaged in the task of preserving knowledge and writing systematic scholarly works . . .

The intellectual sciences were also the preserve of the Persians, left alone by the Arabs, who did not cultivate them. They were cultivated by arabicised Persians, as was the case with all the crafts, as we stated at the beginning . . .

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Expression of Beliefs and Values in Material Culture : Major Crafts and Public Works

Science, Math and Medicine from Iran to Europe

Continued from previous slide, Ibn Khaldun :

This situation continued in the cities as long as the Persians and Persian countries Iraq, Khurasan, and Transoxiana, retained their sedentary culture. But when those cities fell into ruins, sedentary culture, which God has devised for the attainment of the sciences and crafts, disappeared from them.”

- 1) Charles Issawi, *An Arab Philosophy of History : Selections from the Prolegomena of Ibn Khaldun of Tunis (1331-1406)*, 1950, p. 61-63
- 2) Three-volume translation by Franz Rosenthal, op. cit.
- 3) Richard N. Frye, *The Golden Age of Persia*, p. 150

In his last statement quoted above Ibn Khaldun alludes to the Mongol (early 1200s) and Tartar (late 1300s) invasions of Iran and destruction of its centers of learning. Yet, having little in the way of culture of their own, in the next generation these invaders adopted Iranian culture and became ardent proponents of it, as Alexander, 1500 years before them had adopted Persian customs, court, protocol rules and administration. As writes M. Philips Price : “Throughout all the ages, in spite of Arab, Mongol and Tartar invasions and devastations, Nature through the agency of the fertile oases has restored to Iran the damage inflicted on her by man and has given the Persian that material wealth which has enabled him to build a culture of undying fame . . . The Persian is always being conquered by the sword, but in turn always subdues the conqueror by his intellect.”

War and Revolution in Asiatic Russia, 1918, p. 33-34

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