Comparative Foundations of Eastern and Western Thought

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Abstract: Modern science and technology originated in Western Europe within a specific culture, but they have now been adopted and developed by several Eastern countries as well. We analyze the features of Western culture that may explain the rise of modern science with its associated economic development. A comparative analysis of Eastern cultures will then help us evaluate how far could contemporary science be successfully integrated within very different cultures. In this way, we try to estimate the importance of the cultural framework for the development of science and technology.

"East is East and West is West, and never the twain shall meet" (Kipling)

Prologue

I usually live in Montreal, a North-American city with a somewhat European atmosphere. Though known for ferociously cold winters, it is in many ways a typical example of Western urban life: a grid-like design in most of the city, a narrower layout in the historical center, but on the whole streets are straight and wide, with clearly marked pavements, and crossing each other at right angles. Buildings are laid out along the streets like a marching army. The general impression is of open, easily navigable space, because the city design is so obvious.

But I now write this in an older neighborhood (with a rather dilapidated look) of a middle-size Japanese town, where I have been living for some time. The place is

bewildering for a Westerner: the layout seems essentially haphazard. Dwellings and buildings are thrown together in a jumble without any discernible plan, traditional houses mixing with more recent apartment buildings, small stores and workshops. Streets crisscross at strange angles and sometimes peter out in the middle of nowhere. There are usually no pavements and cars must share the road with bicycles and pedestrians. No public spaces, neither parks nor plazas are to be found. The street pattern looks like something natural (rivulets, say, or capillaries) rather than a human creation. This neighborhood has obviously grown organically without an explicit plan, piece-by-piece as needs arose.

Yet the neighborhood is perfectly functional and quite livable. Traffic is a nuisance, but it is fluid and not particularly dangerous. A commuter train and bus lines offer frequent and reliable service to the town center. Deliveries are made on time and shops are fully-stacked, garbage collection is well organized and streets are clean. So some design does go into the organization of the place, but probably more for the operation of daily life than in global urban design.

Other parts of the town are more recent, however, with a deliberate and intelligible design, and easier to navigate. I am also aware of the regular grid-like design of ancient Chinese capitals, a layout which is still evident in the old Japanese capitals of Nara and Kyoto. Still, the erratic, apparently random aspect of my present neighborhood is in fact very common in Asia and probably more typical of Asian society on the whole.

The point is that I now find myself in a different culture, which is manifest in very different surroundings. What could explain these differences? This is what we would like to investigate here, by looking more closely into the cultural history of Western and Eastern countries respectively. Beside outward appearances, these differences may have had deeper consequences.

Introduction

In the 20th century onward, countries of Eastern Asia have displayed an impressive economic development, harnessing the resources of modern science and technology to build efficient industrial organizations.

This process started first in Japan, was taken up later in South Korea and smaller Chinese territories such as Hong Kong, Taiwan or Singapore, and still later in mainland China, but the economic might of East Asia is now a massive fact of today's world. Yet the competent use of modern concepts and techniques has taken place in cultures and societies very different from the Western societies where these concepts and techniques originated.

There has been in Asia large-scale borrowing (and subsequent development) of Western technology, but (by and large) without borrowing the corresponding cultural framework. Many social and cultural changes have accompanied economic development in East Asia, but these societies remain very much alien to Western practices and values. Religious beliefs, social norms and behavior are often markedly different, and those differences probably go deeper than meets the eye.

It is a fair question to ask whether this development can go on beyond the catch-up phase (emulating Western development levels), and where it might then go… It is also an interesting problem to ponder how development was possible in the first place, in spite of different cultural values and references.

It is not evident, however, that this question really makes sense as formulated: maybe technological and economic development can happen in quite different frameworks, or maybe it can happen regardless of cultural framework. Yet history seems to show that economic changes are closely linked with cultural values and concepts, and are difficult to replicate from one culture to the next. Economic development requires the competent use of modern techniques and management methods, which are associated in turn with a scientific mindset that arose in Western Europe.

To answer such questions, we must examine in greater detail the cultural foundations of Eastern and Western societies respectively. Beside the inherent interest of such an inquiry, we want a better image of the cultural landscape in which technical and economic development takes place. We will try to describe as clearly as possible the cultural assumptions, the prevailing worldview and basic notions of each cultural sphere. We are aware of the danger of simplification and stereotyping, but let us consider this inquiry a useful first step toward a more nuanced discussion.

In this text, we will then in turn:

- analyze the conceptual foundations of Western and Eastern cultures.
- discuss their importance for technological development.
- evaluate possible future developments in our globalized world.

Lastly, we will reach a tentative conclusion about the links between culture and technical development, and likely consequences for both Eastern and Western societies.

Cultural approach

Starting in the 1940s, the English scientist Joseph Needham, together with several Chinese collaborators, investigated and documented in a series of volumes the long history of traditional Chinese science and technology. Contrary to current opinion at the time, they showed convincingly that until the Renaissance, and possibly to the end of the 18th century, China was actually more advanced technically than Europe. They illustrated this view with an impressive list of Chinese inventions: cast iron, ceramics, paper, book printing, gunpowder, the magnetic compass, canal locks, and others, often centuries before similar developments in the West.

Yet in spite of his evident love of Chinese culture, Needham felt compelled to remark that the rise of modern science took place in Europe and wondered why China missed out on this development for all her previous technical successes. If one defines modern science as systematic experimentation together with mathematical formalization, this was a purely European development, which after a slow, gradual start, grew exponentially and gave Europe the primacy in knowledge, technology, economic and military power. So why did China (and all other advanced civilizations of the time) fail to advance to modern science?

Needham's tentative answer to this question was mostly cultural: modern science was the result of the peculiar intellectual heritage of Western Europe, whereas classical Chinese culture was simply not conducive to the systematic formalization necessary for cumulative scientific development. One may think that social, political and economic factors also played a role, but the cultural differences between Europe and East Asia are so evident and

so glaring that we would like here to pursue this cultural explanation first and foremost.

Max Weber is another relevant author in this area. A generation before Needham, he contended that the rise of capitalism was strongly linked with the Protestant ethic. This is a debatable thesis (merchant capitalism actually started in Catholic Italy before the Renaissance) but Weber went on to study the religions of China, India and ancient Judaism systematically to examine their relations with social, political and economic attitudes. The scope and depth of this cultural inquiry is still impressive today and very stimulating.

If this cultural approach has some validity, Needham's question (which was mainly a historical one) can now be reformulated: can Eastern countries develop modern science and technology *beyond* what is needed to catch up with the West? That countries such as Japan, China or Korea have brilliantly mastered modern technology is an indisputable fact, but one may ask how much they can now contribute to conceptual advances and not simply to run-of-the-mill scientific research and technological development.

In other words, are modern science and technology culture-free? Can they be successfully cultivated in a very different cultural framework from where they originated? Are history, philosophy, religious and political attitudes relevant or not to the development of science and technology? And can we try to predict its future course in the East after the catch-up phase: will development stall, or will it go on? Or drawing on Eastern traditions, could it take an original path, previously undreamed of in the West?

Before we go on, an important caveat or restriction is in order. We write of East and West as if they were homogeneous entities with clear boundaries. Of course, they are not, and both traditions show great variations in space and time. For example, the feudal society of Japan was very different from the bureaucratic Chinese state, and the fall of Rome marks a great divide in Western history. For the sake of argument, however, we will treat East and West as ideal types (in Weber's sense), alluding to actual variants only when necessary.

Also, by the "West" we mean mainly Western Europe and its cultural offshoots, notably in America (we will not take into account the specific history of Eastern Europe). We will consider Muslim culture a variant of Western culture, although with peculiar characteristics. By the "East" we mean mostly China and countries strongly influenced by Chinese culture,

i.e. Japan, Korea and Vietnam. They can be characterized by a variable syncretism of Confucian ethics, Taoism and (Mahayana) Buddhism. We will not say much about India, with her peculiar mixture of mysticism and philosophical speculation representing a very important cultural universe in its own way, intermediate between East and West.

Foundations of Western culture

The two main foundations of Western thought are Greek philosophy and Biblical beliefs (formulated in the main within a couple of centuries around the 5th century BC). These two viewpoints have been amalgamated into an uneasy synthesis, first by early Christian thinkers, later on by Muslim and Jewish philosophers, and finally by European philosophy from the Middle Ages onward. Although these two forms of thought are probably mutually incompatible in the long run, they provided together the framework for Western intellectual and scientific development.

1) Greek thought

In spite of an extensive and lively mythology, intellectual speculation in Greece was remarkable very early on by its rationalism: a view of the world as moved by natural forces, requiring purely physical explanations without recourse to myth or divinity. Moreover to these descriptions were soon added formal languages of logic and mathematics, which the Greeks were the first to develop in the West. The abstract, formalizing character of Greek thought is a crucial element of its legacy to future ages.

Another important facet of Greek culture is the notion of the free citizen of a city-state, free to think by himself, to discuss political issues publicly and to participate fully in the decision-making for his city. In short, cultural and political democracy is the other main point of Greek civilization (although women, slaves and foreigners did not share in the common polity).

There is some relation between these two facets: the public political debate associated with democratic life encourages the explicit expression of opinions and fosters a high regard for eloquence and argumentation. The interest in the form of good public arguments

probably motivated the formalization of logic. Still, it seems difficult to explain also the Greek genius for mathematics in this way. In fact the importance given to mathematics was strongly associated with religious, almost mystical beliefs. For the Pythagoreans and Plato notably, mathematics is the key to the ultimate reality, which is hidden beyond ordinary common-sense appearances. This mystical view of mathematics had a profound influence on subsequent Western thought.

The notion of a free citizen, participating of his own accord in a common polity was also shared by the early Roman republic (before the advent of Empire), But in Rome it followed a rather different line, more legalistic and bureaucratic than theoretical, with the development of elaborate codes of Roman law. The importance of (systems of) public, explicit laws, though not unknown to the Greeks, is then mostly a Roman legacy and proved to be a useful complement to Greek thought.

2) Biblical beliefs

The Bible, i.e. the Old and the New Testament, presents a rather different worldview. For Greek philosophy, the universe was simply a given fact, and divinity had a limited role (if any) in operating or managing events in the world. For the Bible, however, the universe was created *ex nihilo* by a personal God, following a coherent plan. This is indeed the first verse of the Old Testament: "In the beginning God created the heaven and the earth". Although superior to humans in every way, God is presented as a rational being, motivated by comprehensible reasons. God is thus not unlike humans, and a dialogue is possible with such a divinity (the Old Testament offers quite a few examples of familiar dialogues between God and various prophets such as Abraham or Moses).

The world created by this God is therefore fundamentally rational, potentially intelligible and worthy of description, *because the world was created by an intelligence compatible with ours*. The Bible goes on (in the Pentateuch) for God to give moral laws to mankind, again making for a coherent, comprehensible world in which human beings find their place.

In spite of its ultimate theological basis (God being the first cause and the final arbiter), this worldview is quite rational compared to earlier mythologies. What is important is not so much the monotheism, but the coherence, regularity and intelligibility of God's plans for

the world and human affairs. The compatibility of this view with Greek rationality (with its religious connotations) is perhaps not so surprising after all, as they represent a parallel evolution of conceptions on both sides of the Mediterranean sea.

The Gospel of St John for instance expresses an early syncretism of Biblical belief and Greek (Platonic) thought vividly:

"In the beginning was the Word (*o logos*), and the Word was with God, and the Word was God."

The synthesis between Bible and Greek philosophy was also facilitated by the confusion between moral laws in the Bible, Roman juridical laws and the physical laws of Greek science. It might seem strange to a modern mind, but till the Renaissance at least there was not clear distinction between physical laws and moral or legal laws. That we still use the same word today in European languages (*law, loi, Gesetz…*) for such different notions is a legacy of former times, when the distinction was not yet made between prescriptive and descriptive laws. It was only later that the different senses of the notion of "law" were slowly worked out.

Another Western feature is a strong undercurrent of critical thought and personal judgment, even at times of deep and overwhelming religiosity. This freedom of thought is due to Greek (and Roman) democracy, but also to the peculiar history of Judaism and early Christianity, which resulted in a lasting distance from political power and a skepticism of official thought (the Jews because they had lost all political power, the Christians because they didn't have any for centuries).

Two more Western characteristics, due mostly to the Bible, should also be mentioned. Mankind (created in God's image) is special in the universe and fundamentally separated from nature, for better or for worse. Man is alienated from nature, but may pretend to higher standards. And time is directed, with a clear direction from the moment of creation toward an end of time, often seen as a journey to some kind of paradise (this is probably of Persian origin). The idea of progress is implicit in this conception of time, and explains much of Western social and political beliefs and behavior.

To sum up, Western culture, inheriting from both Greek thought and Biblical beliefs,

developed a very peculiar view of the universe: a world created by an intelligent being, according to specific laws that can be publicly formulated, and thanks to Greek mathematics, highly formalized if need be to attain the ultimate truth.

The consequences of this worldview have been enormous, and are still felt today. They largely explain the rise of modern science in European culture, as well as the political history of Western countries. We have here a strong case to argue for the importance of culture to scientific development.

The odd case of Muslim culture

It might be interesting at this point to consider the intellectual history of Muslim civilization. The cultural foundations of Muslim thought are basically similar to those of Western Europe, and yet Islamic countries have eventually followed a rather different path. Muslim history seems to be a counter-example to our cultural hypothesis, and well worth investigating.

Biblical beliefs and Greek philosophy are also the two main foundations of Muslim thought. The Koran openly subsumes Biblical beliefs in its worldview: a God-created universe, divine dialogue with the prophets, God-given moral laws, an egalitarian view of men, directed time ending in a final judgment… And Islamic thinkers soon adopted Greek philosophy as their intellectual framework, commented very competently on Greek philosophers, developing their philosophical concepts even further.

Muslim scholars also adopted and developed Greek mathematics and scientific knowledge. For a period of about three centuries (from the 10th to the end of the 13th century) there was a brilliant era of Muslim philosophy, science and technology. Muslim achievements were indeed crucial to the development of European culture in the Middle Ages: medieval philosophy in Europe consisted largely at first in commentaries on Islamic philosophers, who transmitted much of Greek philosophy to Europe. And Europeans also borrowed heavily scientific and technological ideas from the more advanced Muslim civilization of the time.

Yet Muslim culture basically came to a halt after the 13th century and stopped developing

(on the whole, although intellectual creativity lasted longer in Persia). Intellectual discussion, scientific progress, technological and economic development withered, and Islamic societies almost froze in place, while Western Europe was starting on an ascending course which would take it to world domination. Muslim culture became more and more characterized by a narrow conservatism, an absence of critical thought and discussion, a lack of creativity and innovation. A typical (and crucial) example is the refusal to adopt book-printing although the technique was perfectly familiar.

The decline of Muslim civilization is one the great mysteries of world history, and various explanations (social, political, economic…) have been proposed. We do not intend to solve this enigma here, but we would like to point out that the foundations of Muslim thought were in fact narrower than those of Western Europe. The Muslims translated Greek philosophy and science (they went together in those days), but nothing else of Greek culture: neither history, literature, poetry, nor mythology was considered relevant. That is to say, they borrowed only what they deemed useful, without the rich Greek cultural heritage.

In so doing, Muslim culture might have missed a vital ingredient of Greek thought: the spirit of free inquiry and critical discussion. This fundamental attitude of Greek culture is not only contained in philosophical treatises, it is part and parcel of a whole culture, and more concretely (and convincingly) represented in literature and history.

Similarly, the Koran is a self-contained, rather slender book, which does largely without the rich, contradictory, incoherent, varied stories, beliefs and discussions contained in the Biblical canon. The Old Testament and the New are both quite different and rather diverse. Islam is avowedly a simplification and rationalization of more complex, somewhat incoherent Jewish and Christian traditions, and this simplification might have been a loss.

This mindset could be a good example of limited "technical" borrowing without bothering with the underlying cultural framework. One may think that limited borrowing gave Muslim thought too narrow a base, which was soon exhausted and could not sustain further developments, though this would be very difficult to prove…

But there are of course other factors to consider. For complex reasons (notably the growing influence of Persian thought), Muslim culture gradually acquired a mystical and anti-intellectual bias that was inimical to rational discourse (in a nutshell, Averroes gave

way to Al-Ghazali). And because Islam tends (because of its early success) to conflate political and religious power, an independent, secular debate could not develop as it slowly did in Europe, where there usually was some distance between religion and political power.

In short, the decline of Muslim civilization, starting from bases similar to those of Western Europe, is an apparent counter-example to the importance of cultural foundations. On closer examination, it might be on the contrary a good example of the problems posed by limited borrowing, but here the evidence is debatable and uncertain.

Foundations of Eastern culture

The foundations of Eastern thought are more diffuse, but they can be extrapolated from the Chinese classics (Confucian and Taoist), from Buddhist philosophy and folk beliefs. Most of it had already been formulated by the 5th century BC. Taoism seems particularly relevant here, as it is much more interested in natural phenomena than Confucianism. The syncretism of Taoist and Buddhist beliefs (particularly noticeable in Zen thought), with a strong influence of Confucianism, constitutes the basic framework of the East Asian worldview.

1) An organic conception

This view of the world is strikingly different from Western thought. In the East, there is basically no personal God and *the universe is perceived as some kind as giant organism*, uncreated, eternal but evolving according to a quasi-biological dynamism. One of the oldest Chinese myths for instance explains that the universe originates from the body of a giant: his breath gave the wind, his eyes became the sun and the moon, his body parts turned into various parts of the landscape, and so on…

Such an organism will follow its own laws, but these are tacit, obscure, fluid, contextual, changeable, and not easily pinned down. These laws (if any) are nothing like the clear principles of Western thought, and there is little interest in making them explicit. On the contrary, many Eastern thinkers (notably Taoist and Buddhist writers) warn about the

foolishness of trying to express fluid, fuzzy experience with hard-edged descriptions: the moment one might think to have captured reality with words, reality has already flown away. On closer examination, explicit representations vanish like a mirage...

In agreement with this tacit global view, Easterners tend to perceive and describe situations as a whole, avoiding analysis into components. Perception is the preferred mode of cognition, and action should be spontaneous if possible, from calligraphy to swordsmanship (after rigorous training if necessary!). An insistence on systematic connections and correspondences between various domains (e.g. seasons, colors, directions, materials, body parts...) results in an integrated picture of the universe. This is obviously very different from the paramount importance given to analysis and deductive reasoning in the West.

This holistic attitude (positing the whole as primary, and possibly irreducible to analysis) is not unknown in the West, from Spinoza to Hegel. But it has always been there a minority view, usually associated with some kind of intellectual mysticism, while the spirit of European science and philosophy is decidedly analytic.

There are no God-given moral laws either, no detailed set of prescriptions and proscriptions in Eastern thought. A few general (and fairly obvious) principles, such as benevolence or compassion, are recommended instead. The emphasis is laid on following traditional rituals and social customs rather than on the rigid observance of explicit laws, adapting general principles to circumstances.

As there is no clear separation between the physical or biological world and human affairs, social customs are not fundamentally different from the natural state of things. They should be followed not so much because reward or punishment is expected, but because it's plain common sense to do so (as it is common sense to conform to physical laws). Social order is part of the natural order of things, and it doesn't make much sense to rebel against the universe! Easterners tend to "go with the flow" as much as possible, and reformers and dissenters are therefore fewer and more subtle than in the West.

The universe is constantly evolving, however, and Eastern morality is much less dogmatic and narrow, more supple and fluid than Western codes of behavior. For somebody brought up in the grim Biblical tradition, Eastern moral attitudes can be very refreshing. There is no

clear direction of time, moreover, because the cyclical time of Buddhism (inherited from Indian culture) contradicts the Chinese sense of history. Hence no clear idea of a direction of history to which men should contribute by their actions.

In short, whereas scientific laws were initially assimilated with God-given moral laws in the West, there is in the East an assimilation of social custom with the organic order of the universe.

Let us quote a few lines from Laozi or Lao Tzu (老子), which succinctly summarize this Eastern view (*Tao Te Ching*, XXV). The absence of a personal divinity, the hierarchic, organic order, the self-referential way of the world can all be found in this short quotation (our translation):

"Man obeys the earth,	人治地
The earth obeys the sky,	地治天
The sky obeys the way (the Tao),	天治道
The way obeys its own nature."	道治自然。

We could also quote Confucius, who expresses an almost casual lack of interest in anything supernatural: only social life matters. And the fundamental agnosticism of Buddhism reinforced this emphasis on the here and now and the disregard for otherworldly abstractions (although it came from the highly metaphysical Indian culture, Buddhism also became much more pragmatic in China).

2) A strangely modern view

This organic view of the universe was not conducive to modern science, and a naturalistic view of social order makes for more conformist social attitudes. Such a cosmos would still have been comprehensible to Europeans of the Renaissance, who also saw the world as a web of correspondences, but this connected world was gradually replaced by the more fragmented and mechanistic approach of early modern science. Yet, this organic worldview is probably more in harmony now with contemporary science than with classical science, and social order might evolve more naturally, less jarringly than in Western societies.

Whereas the Eastern worldview was not favorable to the mechanistic, formalizing and rather piecemeal approach of early Western science (from the Renaissance onward), it is strangely compatible with recent developments of modern science. The Darwinian theory of evolution, notably, describes a biological world not so much ruled by specific laws, but driven by ceaseless incremental adjustments due to random changes. An organic, dynamic conception of the world is quite congenial to the constant tinkering with pre-existing material proposed by Darwin to account for the evolutions in the biological realm.

The theory of relativity as well, where time and space are no longer absolute frames of reference, but must be understood as relative to a global framework, is a far cry from the simple unconditional laws of early Western science. Quantum theory, with its probabilistic descriptions of subatomic events and its breaching of the distinction between observer and reality, has been a revolution in Western thought reminiscent of Eastern speculations (Buddhist philosophy in particular). Dynamical systems and system theory are also more compatible with a holistic outlook than with traditional science.

Contemporary science is no longer deterministic and narrowly analytic. Randomness has become inescapable (in quantum theory notably), complex systems are practically unpredictable (because of their sensitivity to initial conditions), and non-linear systems cannot be reduced to the sum of their parts. The classical conception of simple, deterministic scientific laws is simply not appropriate any more.

Be it as it may, these recent upheavals in Western scientific thought have been due essentially to internal causes and developments and owe little to Eastern influences (this could be an argument against the importance of culture, which did not prevent novel developments). And neither have Eastern thinkers taken much note of the possibilities of convergence afforded by the recent evolution of Western science and theory. The global domination of Western thought is so great that thinking beyond its present frame may simply not be possible yet for most Eastern scientists.

To sum up, the idea of explicit natural law did not have in the East the quasi-religious status it possessed in the West, and this is very likely one of the main reasons, and possibly the most important one, why modern science was first developed in Europe and not

anywhere else.

On the other hand, the flexibility and dynamic tendency of Eastern thought, the insistence on the powers of intuition, the distrust of rigid abstractions are very appealing when compared to the amazing dogmatism and intolerance that have too often been the plague of Western culture.

Consequences of cultural thought patterns

Let us now examine in more detail what the consequences of these different cultural backgrounds could be, keeping in mind that culture may or may not matter in the end.

1) In the West

The Western intellectual framework has probably been decisive in the advent of modern science and the course of social history in Europe. This is not something that one can prove in an irrefutable manner, but the particular combination of Greek abstract formalization and Biblical belief in a personal God was the perfect basis to give rise to modern science.

The quasi-religious status of scientific laws is a strong incentive to scientific research, and for early European scientists (who were sincere Christians till the 18th century at least), science was a way to get closer to God. It is still not rare nowadays to hear researchers speak of their joy in "having put together a piece of God's creation" with their work. Even if scientists often are skeptics or atheists now, this is simply part of the folk culture in which all Westerners have been brought up. This almost mystical motivation for research (getting close to God's truth) can be found repeatedly in the declarations of great scientists (from Kepler and Newton to Einstein).

The explicit and public formulation of natural laws is also a practical device to facilitate the constant addition to previous knowledge and revision of former beliefs. The systematically cumulative nature of scientific research results in an exponential growth of knowledge. If you add the spirit of free inquiry and the critical mind inherited from Greek culture, you have a very powerful engine indeed for the rapid development of scientific knowledge.

Yet this combination of Biblical faith and Greek thought is not a coherent synthesis (in spite of all the efforts of medieval philosophers). Faith and reason are not really compatible. There always was a tension between religious dogma and free inquiry, and time and again religious and civil authorities tried to prevent the spread of new ideas. To give a recent example, the Darwinian theory of evolution still faces religious opposition in the West. And Christian society was also remarkable for the most appalling dogmatism and intolerance, a frame of mind, which was then transferred to secular political ideologies with devastating consequences.

The religious overtones of abstract generalization permeate Western culture, to an extent of which Westerners seem largely unaware. Religious dogma in Europe was usually violently intolerant of dissensions from orthodoxy, but supposedly secular ideologies such as nationalism, communism or Nazism have also been murderously intolerant on an even larger scale. As a result, Europe in the first half of the 20th century has been a slaughterhouse of gigantic proportions, with tens of millions of victims. Massacre for ideological reasons has been an inescapable part of Western culture.

Yet the same stubborn, bigoted dogmatism that led Europe to burn dissenters at the stake and to slaughter minorities gave many dissenters the strength to uphold original views in the face of overwhelming opposition. Being convinced of speaking God's truth enabled them to persist in defending minority views, until martyrdom if it came to that, and this is also part of the Western heritage.

2) In the East

By comparison, the absence of these features in Eastern traditions goes a long way to explain why modern science did not develop in the culturally advanced societies of Asia. There simply never was the same religious passion for the formulation of natural laws, and the same reverence for the abstract language that underlies modern science. The emphasis on social conformity in Eastern societies also acts as a brake on critical thought, intellectual discussion and social development.

At the same time, the flexibility and tolerance of Eastern moral and social attitudes stand in sharp contrast with the dogmatism and bigotry that has too often accompanied religious

and political debates in the West. Unfortunately, the importation into Asia of Western ideologies such as nationalism and communism has had the same disastrous consequences as in the West. In China, the influence of Christian messianism on the Taiping rebellion in the 19th century proved to be a catastrophe causing millions of victims, and the Maoist "cultural revolution" was equally destructive. Japanese nationalism in the 1930s was also remarkably intolerant, brutal and self-defeating.

In the meantime, we fear that East Asian cultures may still fall short of the better side of Western countries. Asian countries have shown themselves more than able to master the technical aspects of Western culture and they now contribute honorably to scientific research. Japanese, Korean and Chinese scientists are worthy members of the global worldwide scientific community, highly competent and hard working.

But it seems to us that their contributions are still what could be called "everyday research" and do not yet include truly great, epoch-making intellectual achievements. We do not see the same passion for discovery, the same playing around with concepts that underlie Western creativity (even if these are actually not so frequent in the West either!). This situation might be temporary, but it might also be the sign of a deeper lack of cultural foundations.

We would be glad to be proven wrong in this matter, but we think the issue is still undecided. And the continuing lack of political freedoms in mainland China and Vietnam, as well as persistent authoritarian strains in Japan and South Korea, do not bode well for the development of truly independent critical thought in East Asia. Relative flexibility and tolerance are not enough without true freedom of thought and expression.

Role of institutions

We have followed so far a mostly cultural approach to historical developments (although with some degree of skepticism). An objection to this line of argument is that it neglects the importance of social and political institutions. Max Weber, in his analysis of different world cultures, mixed freely the influence of religions, the social structures and values, and the role of institutions.

So maybe science (or home-grown capitalism, or industrialization, etc) did not develop in China not because of its particular culture, but because the specific social and political structures of Chinese society made it unlikely.

The Chinese Empire kept all society under rigid bureaucratic control for centuries on end, and independent economic, civil or intellectual institutions could not develop outside the all-encompassing, imperious Chinese state. For science to develop, some kind of social or intellectual space in which to grow would have been necessary, and no such space was readily available in traditional Chinese society. In comparison, European society was much more pluralistic, because Western Europe was divided into independent, conflicting cities and states, and a merchant class slowly gained importance and power.

We could now answer this objection by remarking that social institutions are also part of a general culture, and go together with corresponding intellectual views. The authoritarian tendencies of the Chinese state are in perfect agreement with a culture that emphasizes social order and harmony at the expense of individual freedoms. So institutions are certainly important, but they are also part of a more general cultural framework and they should not be considered in isolation from the whole of society.

Even though Japanese society was quite different, its political institutions have not been favorable to public critical discourse either. The history of Japan consisted for centuries in ferocious warfare between feudal clans. Because of their constant rivalry, these clans were very much interested in economic and technical development, and they welcomed any technique that gave them an edge over rivals. But after the unification of Japan in the 16th century, the central government became adverse to any form of intellectual discussion, enforcing instead a strict Confucian orthodoxy and rigid social order.

Still, the persistence of feudal structures in Japan after unification made it possible for Southern clans to retain a degree of autonomy which allowed them to dissent from, and eventually rebel successfully against the central government. This is how modernization started in the late 19th century with the Meiji revolution, enabling Japan to become the first industrialized (and most westernized) country in Asia.

As a matter of fact, when one examines closely the development of societies with an open mind, it becomes obvious that a tangled web of causes is at work. Cultural beliefs and

values, social structures, political institutions, economic practices and property rights, all interact in various ways to determine the course of any society. These diverse components sometimes conflict with one another (leading to social tensions) but they usually influence each other, so that they tend to evolve in compatible directions. We have chosen a cultural approach primarily, but culture could also be seen as representative of a whole civilization.

In short, institutions do matter, but they are very difficult to disentangle from the surrounding culture. It is reasonable then to consider culture as a global package that includes institutions in its framework. But it is also prudent to avoid seeing culture as the sole determinant of social evolutions, because no single type of causality is likely to account for complex social phenomena.

What could the future look like?

We won't try to predict the future. This pretension has been out of fashion for quite some time now (the success rate is much too low). And we do not believe in an "essentialist" view of cultures, which would be condemned to follow a narrow path determined by their specific nature. Cultures are much too complex, heterogeneous, and in constant evolution. But it would be useful to chart possible courses of development, and to propose several scenarios. We discern the following possibilities for East Asia:

- limited development

If partial borrowing (i.e. limited to science and technology without their cultural foundations) is indeed insufficient for full-scale scientific progress, Asian countries will go on adopting (and often refining) Western ideas and techniques, but won't prove capable of important original contributions. They will remain stuck in catch-up mode even if and when catching up has been successfully completed. If access to Western knowledge becomes difficult, or if progress stalls in Western countries (which is not impossible), Asian stagnation or even decline is quite possible in this scenario (to be compared with the history of Muslim decline).

- full-scale development

If science and technology are in fact self-contained, there is nothing to prevent Asian cultures from developing modern science and technology just as any other country in the world. The different cultural backgrounds we have outlined may have had a historical importance, but modern science is now a global phenomenon. Maybe the scientific method is mostly a set of rules, procedures and practices which can be followed almost blindly to produce valid results. Provided basic conditions are met (a decent education system, good academic institutions, enough funding for research), Asia will contribute to a worldwide scientific community in proportion to its size. The constant exchange of publications, students and researchers will thus ensure the homogeneity of global science the world over.

- original Asian path

Another intriguing possibility if for Asia to develop its own brand of scientific culture in the future. There are very strong control mechanisms within the scientific community (peer review, reputation effects…) but if they are respected, one can put forward original theories. The organic, dynamic, holistic outlook of Eastern cultures is strangely in tune with present trends in theoretical physics, cell biology or dynamical systems for instance. Innovative work along those lines might then be expected from Asian researchers, even if recent developments have mostly taken place within Western science so far.

If we may venture an opinion, the third possibility (original path) is the most far-fetched at the moment. We don't see much evidence of it so far, but it's still an open possibility. The first case (limited development) corresponds more closely to the present state of affairs, but the second one (full-scale development) seems quite likely too. Truly great Asian scientists are still mostly found in American laboratories, where they are offered resources and freedom to pursue their own path, rather than in Asia, but this could change quickly.

Epilogue

Going back to differing urban layouts, we can now try to explain the difference between

East and West. In Western culture, the belief that the world was created according to explicit laws probably inspires Westerners to design towns and cities (and other social artifacts) following explicit plans. An organic growth of villages and towns was not rare in medieval Europe, but the original layout was often deliberately redesigned later (Paris is a typical example).

In the East, an organic worldview naturally led to the largely spontaneous urban development that is still evident today in many places. Only political capitals were explicitly designed according to specific plans (sometimes obscured later by further growth). By the way, urban development in Muslim countries is mostly of the organic type, and thus more Eastern than Western in this respect.

Conclusion

We can now reach a tentative conclusion. We have shown how different Eastern and Western cultural foundations really are. Traditional worldviews are largely incompatible: a God-created universe with explicit laws in the West, an implicit, quasi-organic order in East Asia. Dominant personal attitudes are also quite distinct: an individual quest for God's truth in the West, the desire for social and natural harmony in the East.

We have argued that these different traditions lead to different thought patterns, and probably explain to a large extent the fact that modern science developed in Europe and not in the East. This gave Europe a head start on other civilizations. Whether these cultural differences will hold in the future and determine different development paths from now on, it seems too early to say. Still, Eastern countries should be mindful that technical borrowing without the underlying framework might not be sufficient for sustained long-term development.

We have also seen that our original question (whether culture determines historical developments) is more complicated than we first thought. In some cases (such as the rise of early Western science) the influence of cultural assumptions seems predominant. In other cases (e.g. recent evolutions in modern science) the cultural background seems largely irrelevant. So cultural determinism is probably not a wholly tenable position.

At the very least, this type of discussion can raise awareness of the hidden, half-conscious assumptions prevalent in each culture. This may contribute to better mutual understanding between members of different cultures, who must perforce interact in today's world. It is useful to realize that people of distinct cultures operate on the basis of different assumptions. It might also help each culture become more aware of its own set of mind, of its strengths and its limitations, to decide what is worth nurturing and what could be altered.

References

The Bible: Old and New Testament.

Confucius, *Analects* (論語).

E. Conze, *Buddhism, its Essence and Development*, Harper & Row, New York, 1959.

M. Kaltenmark, *Lao tseu et le Taoïsme*, Le Seuil, Paris, 1965.

Laozi, *Tao Te Ching* (道徳経).

B. Lewis, *What Went Wrong*, Oxford University Press, 2002.

J. Needham, *The Grand Titration, Science and Society in East and West*, Allen & Unwin, London, 1969.

B. Russell, *A History of Western Philosophy*, Allen & Unwin, London, 1945.

J.P. Vernant, *Les Origines de la Pensée Grecque*, PUF, Paris, 1962.

M. Weber, *The Protestant Ethic and the Spirit of Capitalism*, Routledge, London, 1905/1992.

M. Weber, *The Religion of China: Confucianism and Taoism*, Free Press, New York, 1915/1951.