500-year periodicity of political instability in the history of ancient Egypt and China. Androgens at work?

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Abstract

DISCOVERY: A periodicity of 500 years has been discovered in the political history of ancient Egypt and documented by means of inferential statistics. Periods of chaos and waning of central power (some of them called „intermediate periods") recurred every 500 years. **DATA & METHODS**: Input for the computation is the mean duration of ruling dynasties calculated per each half century. Fisher's periodogram analysis and Halberg's cosinor regression have been used. A highly significant ($p < 0.00002$) periodicity of approximately 500 years has been found. Data are taken from two different historians and results for low and middle chronology are being compared. **FURTHER RESULTS**: Lability of dynastic power in ancient Egypt as well as China between 3000 and 500 B. C. culminated each 500 years synchronously. No local events, confined to Egypt or China alone, can serve as an explanation. The rhythm of „dark ages" seems to continue beyond Egyptian and ancient Chinese history into the modern era and seems to be world-wide. **HISTORICAL BACKGROUND**: It is a surprising fact, that this periodicity has been known already to the priests of Babylon, who ascribed this to the maleficient influence of god *Nergal*. The same periodicity has been described by the Chinese philosopher Mencius in the 3rd century B.C. and attributed to the will of *tian* (heaven). Egyptians elevated their war god Seth every 500 years and European kings assumed masculine nicknames. **CONCLUSION**: This recurring cultural pattern of aggressiveness and strife resembles overall traits of male psyche or mid-life crisis. We suggest to look for an unknown cosmophysical factor impacting the neuroendocrine system of man by raising the levels of androgens periodically. **EXPLANATION HYPOTHESES**: Sun impacts global weather on Earth, but there is no known significant periodicity of 500 years in solar activity. The Wheeler weather cycle almost fits the cycle of Egyptian political history. But his cold-dry periods seem to lag behind the periods of social destabilization and hence can not cause them. An alternative view (based on idealistic rather than materialistic presuppositions) is, that periodic long-term shifts of archetypes take place within the collective unconscious of mankind independently of external environment.

ORIGINAL ARTICLE

Background: Another comeback of cyclic theories?

Cyclic conceptions of time belong to the oldest and universally spread myth of mankind. Let us remember the Indoeuropean tale about the golden, silver, copper and iron age as mentioned by Hesiod or Indian Atharvaveda. Stoics believed, that at the end of each "great year" there comes an *ekpyrósis*, universal conflagration, in which the world is going to be annihilated and regenerated. These ideas have been especially popular during the time of Roman Empire and were treated by many like Heraclitus, Plato, Zeno, Seneca. Analogical conceptions can be found in the mythology of India, Iran, the Maya and the Aztecs. During the Middle Ages it was Albertus Magnus, Thomas Aquinas, Roger Bacon, Dante and many others, who believed, that cycles and periodicities of world history are controlled by astral influence. A survey of cyclic conceptions can be found in Eliade (1969).

Cyclic theories of sociocultural processes experienced a revival again at the beginning of the 20th century. Well known became the vision of Spengler (1922), who constrained each civilization to roughly 1000 years of existence, the Western civilization being close to the decline of its cycle. Toynbee (1970) and Sorokin (1962) dealt with civilization cycles of unequal length. Many historians of art at that time proposed that there seem to be certain uniformities in the sequence of arts unfolding within each cycle (Deonna, 1912; Ligeti, 1931; Petrie, 1911). Lee (1931) counted the number of internecine wars and revolutions according to all known chronicles in the history of China since 221 B. C. He intuited a periodicity of 800 years in Chinese history. But two and half periods only do not enable to discern coincidental repetition from genuine regularity. Finally Kroeber (1969) concluded, that all hypotheses of this kind have been so far too vague and no perspicious regularity, periodicity or rhythm in cultral dynamics has been in fact proven.

Aim: Is there a universal pattern?

To find out, whether there is a significant periodicity, which could be observed in the history of ancient Egypt, and compare it to the history of China within the same time span.

Data: Ephemerality of pharaonic power

Historians divide the history of ancient Egypt according to the political state of the country. "Kingdoms" (defined as periods of political unity and of strong, centralized government) alternate with "intermediate periods", for which mutual rivalry of local rulers, each claiming sovereign power, is typical. There were periods of peace and stability, when long-lived dynasties succeeded to maintain their power continually for 200 or 250 years. On the other hand, there were periods of disintegration, chaos and violence, during which dozens of ephemeral kings appeared and the life-span of dynasties was not more than a few decades, until they have been overthrown and another usurper seized the throne.

In this study, we took the ephemerality of dynasties to be the measure of the grade of lability of royal power in ancient Egypt. There are 26 Egyptian dynasties since the foundation of the Egyptian state around 3000 B. C. until the conquest of Egypt by Persians in 525 B. C. For each half century of Egyptian history we counted the average duration of the dynasty (or dynasties) ruling. A diagram expressing the stability (resp. instability) of dynastic power resulted.

On the horizontal axis, the time from 3000 to 500 B. C. is displayed. On the vertical axis, the mean duration of dynasties ruling per each half century is plotted against time. The mean duration is calculated as the average of durations of all dynasties ruling in the given half century, weighted by the number of years the dynasty was ruling within this half century. For example, if the 18th dynasty ruled between 1550 and 1307 B. C. (243 years) and the 19th dynasty between 1307 and 1196 B. C. (111 years), the mean duration of rule in the half century 1350–1300 B. C. is calculated as follows: $(43 \times 243 + 7 \times 111)$ divided by 50 gives the result 225.

Data are taken from Baines (1980) and Shaw (2000). Baines uses low chronology, Shaw middle chronology, which slightly differs in dating the early periods of Egyptian history. Results for both types of chronologies are going to be compared. So called "high chronology" has been abandoned by Egyptologists since several decades.

Methods: Periodogram analysis and cosinor regression

Powerful mathematical tools for detection of rhythms and more generally periodic phenomena have been already developed in chonobiology and chronobiometry. Fisher's periodogram performs a spectral analysis of time series data. It enables researchers to detect cyclicity and determines the variance in the data accounted for by cyclic activity. Results describe cycle frequency, period length and amplitude. For all existing period-lengths it calculates their statistical probability and determines, whether there is one or more periodicities in the data, which are statistically significant (Fisher, 1929).

The cosinor method is based on Fourier analysis and performs a harmonic regression by cosine function. It involves the least-square fit to the data of a model consisting of one or several cosine curves with one or several periods anticipated to characterize the data, with or without the inclusion of a polynomial trend. Its role is to justify or not the existence of a given rhythm and to calculate its parameters. It calculates overall the best sinusoidal model that can test pass through the set of experimental points and yields its mesor (a rhythm-

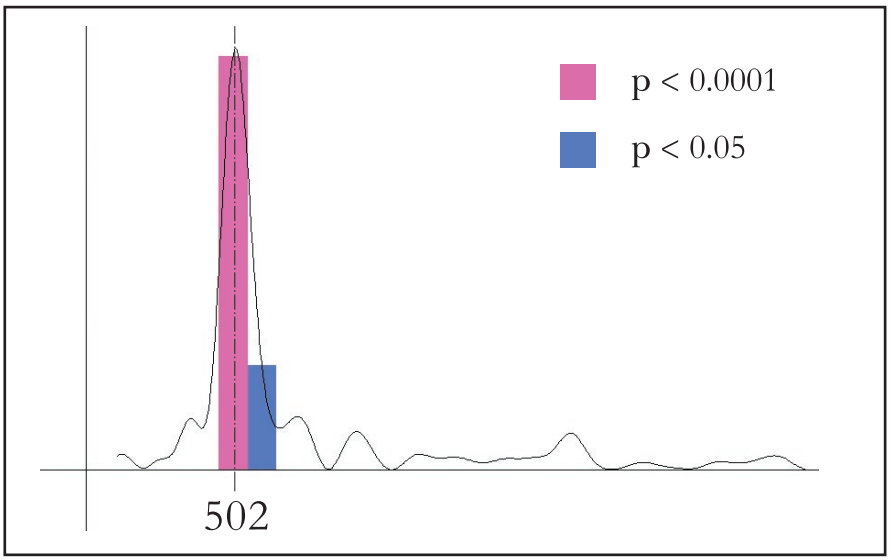

Figure 1: Periodogram resulting from a 2400-year record of mean duration of dynastic power in ancient Egypt between 2900 and 500 B. C. per each half century. On the horizontal axis are period-lengths (from the longest to the shortest). On the vertical axis is a function expressing statistical significance. The interval of statistically significant period-lengths is accentuated by the darker column. Note that there are no other periodicities in Egyptian political history, except the single one of approximately 500 years, which is highly significant.

Table 1: Results of the chronobiometric analysis of ephemerality of dynastic power in ancient Egypt. Two different historical chronologies are being compared.

chronology	data by	period-length	nadir	significance
Low	Baines	495 [years]	2639 B. C.	p < 0.00002
Middle	Shaw	515	2630 B. C.	p < 0.00019

adjusted mean), phase of culmination, amplitude and probability of error (Bingham *et al*., 1982).

Briefly, the periodogram detects whether there are some significant periodicities in the data and if yes, what kind of. The cosinor enables to test the presence of a fixed rhythm. To analyze the data on Egyptian dynastic power, we shall use Fisher's periodogram first to search "blindly" for significant period lengths T. In the second step, Halberg's cosinor regression is going to be applied to test the presence of one leading period τ. It shall be chosen with respect to the outcome of the periodogram. Results are presented as parameter point and 95% confidence estimates and in the form of graphs. Software used is made by Kubáček & Ondrejka (2002) and Kubáček, Valach & Mikulecký (2001).

Results: A clear-cut periodicity

Periodogram revealed a single statistically significant period length T of approximately 500 years. For Baines' data the estimated period length is 495 years, for Shaw's data 515 years. The interval of significance for both estimated period lengths together spans approximately from 470 to 540 years, with the mean value of 505 years. The presence of this periodicity in the data is very clear-cut and highly significant ($p < 0.00002$ and $p < 0.00019$). There is no other periodicity or tendency to another periodicity, which could be observed in the data.

This is why the period length of 505 years was taken into the cosinor computation. Approximation of the data by a 505-years rhythm turnes out to be significant ($p << 0.001$) in either case. The first trough in the duration of dynastic power has been identified around the year 2639 B. C. (for Baines) or 2630 B. C. (for Shaw). Accessory troughs (nadirs) appear in the successive time distances of 505 years ahead (see Table 1 as well as Fig. 1 and 2).

Discussion: Five „intermediate periods"?

The obtained results are extraordinarily interesting. First of all, we discovered, that there exists in fact a rhythm, a regular periodicity in the history of ancient Egypt. The lability of pharaonic power and the ephemerality of dynasties culminated every 500 years: around 2650, 2150, 1650, 1150 and 650 B. C.

Each of these dates marks the end of one "kingdom" (or an important period in Egyptian history) and the beginning of a new one. Around 2650 B. C. so called "archaic period" ended in bloody religious wars. Devastated tombs and damaged skeletons witness to the violent nature of this period.

Table 2: Periodic recurrence of chaotic periods in the history of ancient Egypt. The first column contains the putative about 500-years rhythm. The second and third column contain the historical dates of outbreaks of the chaotic „intermediate" periods according to two different historians. In the fourth column are the current names used by historians.

hypothetic rhythm	DATA BY shaw	baines	chaotic periods in egypt
2650 B. C.	2686 B. C.	2575 B. C.	End of the „Archaic Period"
2150 B. C.	2160 B. C.	2134 B. C.	1st Intermediate Period
1650 B. C.	1650 B. C.	1640 B. C.	2nd Intermediate Period
1150 B. C.	1069 B. C.	1070 B. C.	3rd Intermediate Period
650 B. C.	664 B. C.	712 B. C.	Beginning of the "Late Period"

Table 3: Periodic alternation of dynasties in the history of ancient China. Here taken as probable indicator of periods of instability. The first column contains the putative about 500-years rhythm. The second column gives the most probable historical dates of dawnfall of the old and ascend of new dynasties. The third column contains the span of insecurity, between the maximal and minimal date proposed by different historians. The dates 2698 and 2637 B. C. are legendary, according to Chinese chronicles.

hypothetic rhythm	PERIODS OF INSTABILITY IN CHINA around	tolerance	dynasties
2650 B. C.	2668 B. C.	2698 or 2637 B. C.	Hoang Ti founds Chinese state
2150 B. C.	2150 B. C.	2200–2100 B. C.	Xia dynasty founded
1650 B. C.	1637 B. C.	1751–1523 B. C.	Shang dynasty founded
1150 B. C.	1075 B. C.	1122–1027 B. C.	Western Chou dynasty founded
650 B. C.	771 B. C.	771 B. C.	Eastern Chou dynasty founded

2150 B. C. marks the end of the Old Kingdom and the beginning of the First Intermediate Period. A revolution swept the royal power and a dark age of chaos and discord followed. Property of the rich was plundered, nomadic tribes from Asia invaded Egypt, mortality raised. Governors treated their provinces as sovereign kingdoms. "Seventy kings in seventy days", wrote later the Greek historian Manetho, when recapitulating the story of dynasties 7th to 10th.

1650 B. C. marks the decline of the Middle Kingdom and the outbreak of the Second Intermediate Period. Central power waned again. Nomadic tribes (the Hyksos) invaded the Nile Valley. Neither of the pharaohs of the 13th to 17th dynasties managed to keep the power for a long time.

Around 1150 B. C. the New Kingdom began to disintegrate. So called warrior kings try to defend Egypt against the attacks of the "Sea Peoples". Famine, strikes, revolts, looting bands, anarchy follow. 1070 B. C. the last pharaoh of the 20th dynasty flew secretly from his palace and the Third Intermediate Period sets in.

Around 650 B. C. the Assyrians conquer Egypt (671 to 609 B. C.) and ravage the whole country. The 26th dynasty of Sais, which enters the throne thereafter, has been the last native Egyptian rule. These events mark the beginning of so called "Late Period" (see Table 2).

Synchronicity with China

The fact of almost precise periodicity of 500 years in the history of ancient Egypt itself is startling enough. What is even more startling, is that one and the same periodicity seems to hold for the history of China as well. Although the dating of the earliest Chinese dynasties is much less certain than the Egyptian ones. The periods of political instability in ancient China between 3000 – 500 B. C. obviously coincide with the ones in Egypt.

Around 2650 B. C. (2698 or 2637 B. C.) the legendary emperor Hoang Ti should have founded the Chinese state. This milestone coincides with the beginning of the Old Kingdom in Egypt. Around 2150 B. C. (between 2200 and 2100 B. C.) the epoch of the legendary emperors ends and a new dynasty (Xia) is founded. This happens during the First Intermediate Period in Egypt. Around 1650 B. C. (according to different datings somewhere between 1751 and 1523 B. C.) Xia is replaced by the Shang dynasty. At the same time the Middle Kingdom is replaced by the New Kingdom in Egypt during the Second Intermediate Period. Probably in 1070 the Shang is overthrown by the Chou in China. In the same year the New Kingdom of Egypt disintegrates and the Third Intermediate Period begins. In 771 the Chou rule comes to its end and the turmoil period of "Springs and Autumns" follows in China. Around 700 the "Late Period" begins also in Egypt (see Table 3 and Fig. 3).

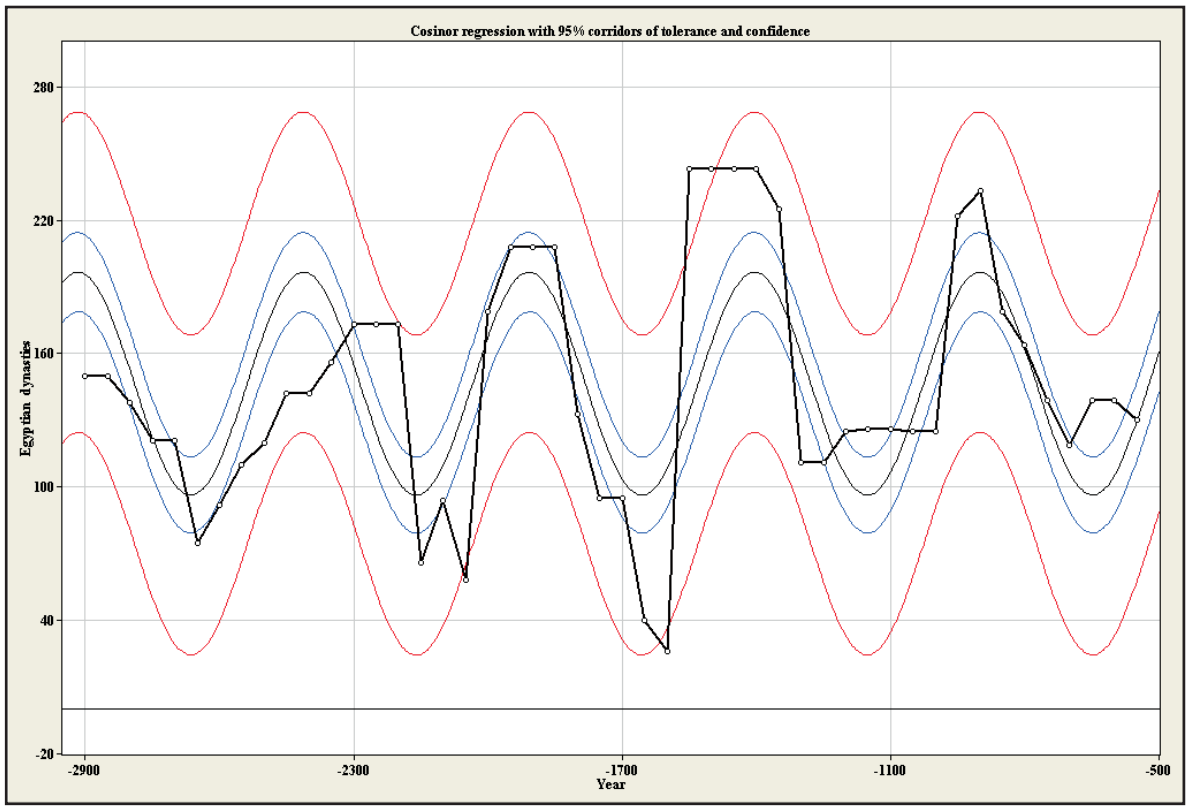

Figure 2: Chronogram of stability and instability of royal power in ancient Egypt. On the horizontal axis is time from 2950 to 500 B. C. On the vertical axis is the mean duration of dynastic power in the given half century (in years). Periodic approximation function (middle cosine curve) with its 95% corridor of confidence (narrower) and tolerance (broader) is shown. Note that nearly all measurements (broken line) lie inside of the 95% corridor of tolerance.

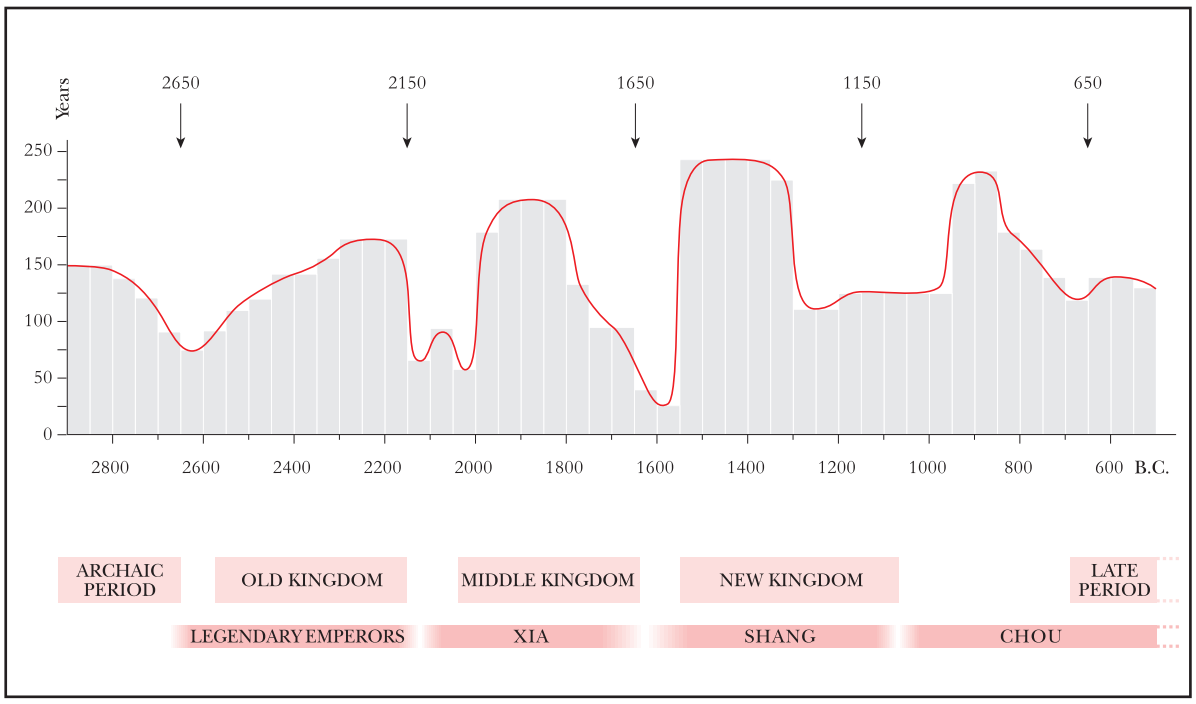

Figure 3: Mean duration of dynasties in ancient Egypt between 2900 and 500 B. C. calculated per each half century. Periods of instability of Egyptian royal power are being compared to the ones in China. Note, that the destabilization of royal power in Egypt and China took place synchronously and recurred every 500 years.

Table 4: Results of the chronobiometric analysis of the history of ancient Egypt compared with the prediction in the Babylonian hieratic calendar.

chronology	data by	period-length	nadir	significance
Low	Baines	495 [years]	2639 B. C.	$p < 0.00002$
Middle	Shaw	515	2630 B. C.	$p < 0.00019$
Average		**505**	**2635 B. C.**	
Expected		*504*	*2655 B. C.*	

The Babylonian calendar

The most surprising fact is yet to come. This knowledge about recurrence of chaotic periods is several millenia old. It has been known and foreseen already by the priesthood of Babylon. Ancient Babylonians employed a calendar, whose central idea was cyclic alternation of gods (Hastings, 1913). Seven main gods of Babylonia – Ningirsu, Marduk, Nergal, Shamash, Inanna, Nabu, Sin – alternate cyclically as ruling spirits of time. Each one of them is ruling the world for 72 years, until he is replaced by the next one. Thus, one and the same deity comes to rule the world each $7 \times 72 = 504$ years again (Páleš, 2004).

This calendar has been interwoven with the Babylonian astrological worldview. The seven gods were identified with seven planets known and worshipped in antiquity (later seven archangels in the Christian era). The rhythm of their alternation was brought into connection with the precession of equinoxes. Each degree of the sphere was ruled by one of these seven gods. Since the shift of one degree of circumference takes approximately 72 years in the precession of the vernal point, each 72 years (a platonic day) another deity becomes the ruling spirit of time.

Note, please, that the fact of any periodic recurring events itself does not necessarily prove astrology yet. This periodicity could have been observed empirically – and the movement of Earth's axis among stars could be used as a clock hand in the sky. Thus the division of the celestial vault into 360 equal portions (degrees), which originated in Babylonia, could possibly have an empirical basis.

The third of the seven gods of Babylon is Nergal, who was identified with the planet Mars. He was considered to be the dreadsome god of war and death, who covets blood, bringing fever and plague. According to the Babylonian calendar he ruled the world in the years 2691–2619, 2187–2115, 1683–1611, 1179–1107, 675–603 B. C. That is every 504 years around the years 2655, 2151, 1647, 1143, 639 B. C. The above periodicity, which we discovered empirically in the history of Egypt is none else, than the periodicity ascribed by the Babylonian priests to the god Nergal. Our inferentially statistical analysis identified this ancient rhythm (504 years) as well as its culmination (around $2655 \pm k.504$, $k = 0, 1, 2, 3...$) surprisingly exactly (see Table 4).

Mencius on the 500-year cycle in the political history of China

The 500-year cycle in history has been observed and explicitely formulated already in the times before our era, independently by Babylonian and Chinese scholars. Mencius (372–289 B.C.), in Chinese tradition ranked as the greatest authority second only to Confucius, was aware of this 500-year cycle in Chinese history: "*A long time has elapsed since this world of men received its being, and there has been along its history now a period of good order, and now a period of confusion... Every 500 years a true king should arise, and in the interval there schould arise one from whom an age takes its name... From Yao and Shun down to Tang were 500 years and more... From Tang to king Wan were 500 years and more... From king Wan to Confucius were 500 years and more...*" (Mengzi, 1970).

Thus Mencius believed that heaven (*tian*) brings periods of disorder every 500 years as a rule. Thereafter a true king arises, who restores unity, order, justice, prosperity, regulates rivers etc. He founds a dynasty and becomes an unsuperable example for later generations. After 500 years the moral strength of his successors vanishes and his dynasty loses the Mandate of Heaven (*tianming*). Mencius exemplifies this by naming three kings: Yu, Tang and Wan – founders of the Xia, Shang and Chou dynasties successively. Later the founder of the Xin dynasty, Wang Mang, legitimized his usurpation of the throne by arguing, that he is the next one in the 500-year succession of true kings.

The rhythm of dark ages and the rise of martial cults

The rhythm of dark ages seems to continue beyond Egyptian and ancient Chinese history into our era and seems to be worldwide. In the 4th century, the expansion of Huns caused the migration of peoples in whole Eurasia. In the barbarism of this century, Roman Empire went down as well as the Han dynasty, which ruled China for more than 400 years. The fall of Rome marks the end of Antiquity.

The 9th century was also extraordinarily militant and violent. Europe suffered the assaults of Vikings from the North and of Magyars from the Asian steppes. Anarchy broke out in America and in China, where the civilization of the Maya and the 300 years old Tang dynasty went down.

The 14th century brought another dark age worldwide. The hordes of Gengis Khan and Timur plundered the whole Eurasia. Almost one third of the population died because of the plague. Signs of depopulation and feverish building of fortresses uncover the excavations in South Africa and New Zealand. In North America, half of the main civilizations perished at that time. The overall synchronicity and periodicity is striking. Obviously, much of the historical periodization in general is based upon this rhythm. The catastrophes of the 14th century mark virtually the end of Middle ages and the beginning of modern era.

At the same time it is intriguing to observe, how the mythology of the Mars-archetype revives every 500 years. According to a Babylonian legend, Nergal temporarily seized the rule over the world in the 12th century B. C. and caused the fall of Babylon. The same holds for the 22nd century and the fall of Akkad. Historians look at these legends as reflecting the fact of nomadic raids. But this does not explain their periodicity – only shifts the question: why do the nomadic raids happen periodically?

The Egyptian Mars is Seth – the god of evil, war, chaos and misfortune. He personifies hostility and violence. In the 27th century Seth was unexpectedly elevated into the position of the protective god of the pharaoh, instead of Horus. The same happened in the 12th century under Ramessids. In the 17th century Seth was believed to be the highest god of the Hyksos conquerors (including the Hyksos themselves, who established their capital in the city sacred to Seth, Avaris). In the 7th century again it was said, it was Seth, who commanded Assyrians to plunder Egypt.

Mongols declared themselves to be the descendants of the Celestial wolf, who was their tribal totem. Obviously, they drew spiritual inspiration from the mythical archetype of a predator, preying upon the sheep (settled cultures) and spreading terror. Wolf is the traditional animal sacred to the warrior-god Mars (think of the Capitoline wolf, who nursed the twin childern of Mars, Romulus and Remus). At the same time in Central America the Aztecs developed an amazing warrior mysticism. Huitzilopochtli became the main god, whose will it was to mantain a permanent state of war and bloodshed.

A hint: Androgens and the pattern of male psyche

Egyptian pharaohs assumed theophoric names derived from their war gods Seth, Montu, Anat periodically every 500 years. The same rhythm goes on with European nobility. A maximum percentage of Christian kings assumed masculine nicknames like *the strong, the bold, the ironside* in the 4th, 9th, 14th centuries. This is evident from the complete lists of rulers and royal chronologies (Gordon, 2005).

The overall cultural pattern in these periods of history displays a whole set of traits typical for the male psyche. Therefore it is suggesting to look for some periodic factor impacting the neuroendocrine system of man by raising the levels of androgens periodically. There is a well known connection between aggressiveness and testosterone in man as well as in other vertebrates (Dabbs & Morris, 1990). How can the levels of testosterone in man of the past centuries be ascertained? There are indirect indices. For instance, the most kings nicknamed *the bald* and *the hairy* lived in the same periods as mentioned above. Loss of hair and growth of axillary and chest hair belong to the virilizing effects of raised testosterone. More reliable indicators can be gained from the proportions of skeletons. The ratio of ring finger length to the index finger length, for instance, indicates how much testosterone we were exposed to during prenatal and early development.

Looking for explanation: Local, global or planetary cause?

Current historians tend to explain every historical event *ad hoc*, by means of causes confined to the examined time and place. Universal patterns in history are being overlooked. For instance, chaotic intermediate periods in Egypt are being explained by a variety of causes like ineffective administration or bad crop: "*Around 2150 B. C., a period of consistently low floods brought half a century of disastrous famine (the First Intermediate Period) which finally tore the old order apart*" (Parker, 1994). In consequence of weakened central power, Egypt falls prey to foreign invaders. If this is the case, the question remains: Why is the administration ineffective every 500 years? Or what causes the periodic low floods of Nile?

Nay, we have to ask: How can the low floods of Nile bring about the breakdown of Chinese dynasties? Or what causes the periodic low floods of Nile *and* the Yellow River every 500 years? The synchronicity of Chinese and Egyptian history requires to look for a factor of global nature. It can not be explained by any local event confined to Egypt or China alone.

Chase-Dunn *et al*. (2000) also reported a strong interconnection of historical development in the West (Afroeurasia) and the Far East: "*We found that increases and decreases in the territorial sizes of empires and the population sizes of cities were highly correlated in East Asia and West Asia/Mediterranean regions from about 600 BCE to 1500 CE.*" This paper reinforces the same observation: simultaneity of historical development in both regions is evident already between 3000 and 500 BCE and thus holds for the last 5000 years at least.

Although there are two differences in both researches of ours and Chase-Dunn when compared: First, Chase-Dunn ascertained a temporal correlation only, whereas we found much more than that – a periodic synchronous rhythm. Second, the findings of Chase-Dunn sug-

gest, that only West and East Asia regions are closely linked togehther (the cause of which can be looked for in the quick movement of peoples, goods, ideas and diseases across Asian steppes), but India falls out of this correlation being separated by the Himalayan barrier. On the contrary our research indicates that simultaneous waves of political instability affected America and Australia as well and could have been worldwide.

To explain a periodic synchronicity of planetary dimensions, global cosmophysical factors should be taken into consideration: the swinging of solar activity, solar wind or the Earth's magnetism. There are long-term cycles in solar activity, approximately 205 years long, which coincide with the same cycles in volcanic activity, and the volcanic activity undoubtedly influences the global weather (Střeštík, 2003a). Further, it seems that 1000–1200 year cycles occur in the climate (in the reconstructed surface air temperatures) with the lowest temperatures around 500 and 1100 A.D. (Střeštík, 2003b). There are also cycles of 180 and 2400 years given by the solar inertial motion. During long term minima of solar activity, a cooldown of climate takes place: "*Small »ice ages« occur approximately every 180 years. Cold climate causes bad crops and this in turn periods of social storms, raids, collapse of central power*" (Charvátová, 1989). For instance the Wolf minimum (1290–1360) is said to be in putative relation with the peasant riots in the 14th century, Maunder minimum (1630–1700) with the chaos of the Thirty-years war, Dalton minimum (1800–1830) with Napoleonic wars etc.

At the beginning of the 20th century, Tchijevsky (1971) made an extensive research on what he called the "universal historical process". He discovered, that a synchronic universal increase of military and political activity takes place in the whole world periodically every 11 years. May be that the sunspot activity heightens the excitability of human nervous system and that is why the crucial historical events tend to cluster around solar maxima. This seems to relate but to the short, not to the long cycles.

There were also attempts to link the periodicities in yearly volumes of water in river Nile with the periodicities in the Wolf numbers of sun spots (Střeštík, Mikulecký & Valachová, 1994) or with the 19-year periodicity in the nutation of Moon´s orbit (Currie, 1987). Long waves in economic history are considered possibly to be connected with solar activity (Ertel, 1997). Attempts to link other creative floruits of arts&sciences in history with solar activity achieve only a borderline significance (Mikulecký, 2007).

The problem is, that there is no known significant periodicity of 500 years in the activity of the Sun (Eddy, 1977). No periodicity of 500 years in Nile floods has been referred either. As far as the authors know, the only work which mentions a 500-year periodicity in climate change is the one by Wheeler (1980). Wheeler suggests, that periods of extreme drought and cold recur every 500 years, which impact history: "*The 1.000-year cycle breaks down into halves, with both resulting 500-year rhythms ending in exceptionally cold and dry phases. Each 500-year cycle termination throughout history has also marked significant upheavals or turning points in society... At each termination of this cycle, a distinct historical epoch has ended and another began... The turning points (between old and new civilizations) occur when cold-dry times reach their maximum severity*". The Wheeler weather cycle almost fits the sought-after rhythm, but not exactly. His cold-dry periods tend to lag behind the onset of dark ages at least 50 or 100 years and hence can not be considered to cause them. They have occured in the 5th, 10th, 15th century A. D., whereas the periods of political instability set in and culminate already before and during the 4th, 9th and 14th centuries. One might conjecture that past culminations of this cold-dry cycle occured in the 27th, 22nd, 17th, 12th and 7th centuries BCE – if they took place at all. Wheeler gathered some evidence for this cycle only since 500 BCE. And modern methods of rainfall and temperature reconstruction (e.g. by analysis of Greenland glaciers) did not confirm the presence of a significant 500-year climatic cycle at all.

There is one astronomical cycle with a period length of approximately 500 years. Conjunctions of Pluto and Neptune occur every 493 years. Charvátová (1989) suggests a possible effect of cumulated gravitation of planets upon solar activity and thus indirectly influence upon Earth. But here the effects of the two biggest planets, Jupiter and Saturn which conjugate once in 19,86 years have been considered first of all. The gravitation pull of the outermost and small planets of the solar system is negligible compared to them.

There exists another alternative view, which should be also taken into account. It goes back to Jung (1964). Jung was persuaded, that there are long-term changes in the collective soul, which take place within the collective unconscious of mankind. These shifts of soul dominants or "archetypes" are standing behind the change of religious cults, rise and fall of "gods" in the course of centuries. The world soul thus yields to its own law, independent of outer environment. In this case, not the cults of Nergal, Seth, Mars etc. are mere secondary reflection of chaotic periods, but violent events are the consequence of changed human psyche. Just the causality would be reverse. This hypothesis is equally thinkable as the cosmophysical one. It differs only in that it presupposes the idealistic philosophic background instead of the materialistic one.

The purpose of this study is only to draw attention to the existence of the 500-year rhythm as a matter of fact. The solution of this fact is a puzzle, which might conceal some fundamental insight into the nature of man.

REFERENCES

1 Baines J (1980). Atlas of Ancient Egypt. Andromeda, Oxford.
2 Bingham Ch, Arbogast B, Cornélissen GG, Lee JK, Halberg F. (1982). Inferential statistical methods for estimating and comparing cosinor parameters. Chronobiologia **9**: 397–439.
3 Charvátová I (1989). The Solar System and the Change of Processes on Earth (in Czech). Academic Press, Prague.
4 Chase-Dunn Ch, Manning S, Hall TD (2000). Rise and Fall: East-West Synchronicity and Indic Exceptionalism Reexamined. Soc Sci Hist, **24**: 727–754.
5 Currie RG (1987). On bistable phasing of 18.6-year-induced drought and the flood in the Nile records since A. D. 650. J Climatol **7**: 373–389.
6 Dabbs JM, Morris RJR (1990). Testosterone, social class and antisocial behavior in a sample of 4,462 men. Psychol Sci **1**: 209–211.
7 Deonna W (1912). L´archeologie, se valeur, ses methodes. Paris.
8 Eddy JA (1977). The Case of the Missing Sunspots. Sci Am **236**: 80–92.
9 Eliade M (1969). Le Mythe de l´éternel retour. Gallimard, Paris.
10 Ertel S (1997). Long Waves in Economic History. Connection with Solar Activity. Proceedings of the 3rd International Workshop "Chronobiology & its Roots in the Cosmos", High Tatras, Slovakia.
11 Fisher RA (1929). Test of significance in harmonic analysis. Proceedings of the Royal Society, London, Ser. A, **125**: 54–59.
12 Gordon BR (2005). Regnal Chronologies, www.hostkingdom.net/genindex.html.
13 Jung CG (1964). Flying Saucers: A Modern Myth. Routledge & Kegan Paul, London.
14 Hastings J (1913). Encyclopaedia of Religion and Ethics. T. & T. Clark, Edinbourgh.
15 Kroeber AL (1969). Configurations of Culture Growth. University of California, Berkeley.
16 Kubáček L, Ondrejka P (2002). Periodogram Analysis. Computer Programme. ComTel, Bratislava.
17 Kubáček L, Valach A, Mikulecký M (2001). Time Series Analysis with Periodic Components. Computer Programme. ComTel, Bratislava.
18 Lee J (1931). The Periodic Recurrence of Internecine Wars in China. The China Journal **14**: 159–62.
19 Ligeti P (1931). Der Weg aus dem Chaos. Callwey, München.
20 Mengzi (1970). The Works of Mencius. Translated by James Legge. Dover, New York. 3B9, 2B13, 7B38.
21 Mikulecký M (2007). Solar Activity, Revolutions and Cultural Prime in the History of Mankind. Neuroendocrinol Lett **28** (6): 101–107.
22 Páleš E (2004). Angelology of history. Synchronicity and Periodicity in History 1. (in Czech). Sophia, Bratislava, 480 pp.
23 Páleš E, Mikulecký M (2004). Periodic Emergence of Great Poets in the History of Arabia & Persia, China and Japan. Neuroendocrinol Lett **25** (3): 169–172.
24 Páleš E, Mikulecký M (2006). Periodic Emergence of Great Historians in the History of Ancient Greece, Rome & China. Comparative Civilizations Review **54** (1): 53–62.
25 Parker G (1994). The Times Atlas of World History. Hammond, New Jersey.
26 Petrie F (1911). The Revolutions of Civilizations. Harper, London.
27 Shaw I (2000). The Oxford History of Ancient Egypt. University Press, Oxford.
28 Sorokin PA (1962). Social and Cultural Dynamics. Bedminster, New York.
29 Spengler O (1922). Der Untergang des Abendlandes. Umrisse einer Morphologie der Weltgeschichte. Oskar Beck, München.
30 Střeštík J (2003a). Possible correlation between solar and volcanic activity in a long-term scale. Proceedings of the ISCS Symposium "Solar variability as an input to the Earth´s environment", Tatranská Lomnica, Slovakia.
31 Střeštík J (2003b). Reconstruction of average air temperatures in the last millenium (in Czech). In Marková (ed.): Man in his terrestrial and cosmic environment. Bulletin of the Astronomic Observatory, Úpice.
32 Střeštík J, Mikulecký M, Valachová A (1994). Nile annual volume 1871–1970: Hic sol laborat? In Mikulecký M (ed.): Proceedings of the 2nd International Workshop "Sun, Moon & Living Matter", Bratislava, Slovakia, p. 52–57.
33 Tchijevsky AL (1971). Physical Factors of the Historical Process. Cycles, January 1971.
34 Toynbee AJ (1970). Der Gang der Weltgeschichte I-II. Taschenbuch Verlag, München.
35 Wheeler RH (1980). The Wheeler Papers in: Michael Zahorchak (ed.): Climate, the key to understanding business cycles: with a forecast of trends into the 21st century. Tide Press, Linden.