A Bi-Dimensional View of Numerical Thinking in Ancient Chinese Culture

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Abstract

This paper explores the numerical thinking in ancient Chinese culture anthropologically from Lévy-Bruhl's (1995) "*principe de participation*" in *pré-logique* and Lévi-Strauss' (1997) *multi-valued logic*, and cognitively from the Gestalt school and Gentner's (1998) research on analogy. It is argued that the schematization, humanization, legalization and aestheticalization of numbers was a centuries-old evolutionary process in which analogy-based numeral thinking arose from individual similarity/proximity categorization and developed into collective representations dominant in ancient Chinese national thinking.

Keywords: Analogy-based numeral thinking, Chinese culture, multi-valued logic, schema, collective representation

Introduction

Numbers are nothing but categories. According to Russell (1959), numbers may be identified with classes of classes and number-theoretic statements may be explained in terms of quantifiers and identity. Thus the number 1 would be identified with the class of all unit classes, the number 2 with the class of all two-membered classes, and so on.

Besides calculation, interestingly, numbers have some strange impact on many contemporary Chinese social behaviors in choosing wedding dates, phone numbers, car plate numbers, even the series numbers of washers, iceboxes and so on. For example, 888 pinyined as *fa fa fa* in Cantonese links with the Chinese characters发发发 meaning "to get richer and richer"; 666 as *liu liu liu* or *lu lu lu* associates with the characters溜溜溜 or 路路路signifying "to take a smooth way"; on the contrary, 4 as *si* reminds some Chinese of the character "死" meaning "to die" while 7 as *qi* connects with "气" indicating "to get angry or indignant". To have effective communication with Chinese people, therefore, one should pay attention to numbers' symbolic meanings in contemporary Chinese discourse.

In fact, the apparently homophonic/assonant association of these numbers' symbolic meanings in contemporary Chinese originates from that of ancient Chinese culture. In addition to the pure categorization function, ancient Chinese entrusted numbers with mystic power to understand the universe, earth and man, to create the mixture of real and possible worlds for thousands of years.

To date, many relevant studies have been conducted on the important role of numbers in classifying the cognized world, soothsaying, constructing an ontological schema of the universe, establishing the social order and judiciary systems, and shaping aesthetic tastes.

The most influential studies (Mou, 2004); Hu, 1973; Li, 1986; Yang, 2005; Zhang, 2003) with numbers as their focus offer us a philosophical perspective; other studies discuss numerals indirectly or scatteredly — Li & Liu's research on Chinese aesthetics (1984) forms an aesthetic angle; Ye's investigation into Chinese legal systems (2002) provides a legal point; while Yao's (2008, p.22) attempt to associate Chinese characters' balanced formation with Chinese typical "balanced analogy" echoes part of our cognitive argument in this paper.

However, the studies above fail to give a deep and comprehensive analysis into numerical thinking either because most approaches are mono-dimensional or because many of them do not focus on numerical thinking per se. No study, above all, has been done cognitively to explore how the analogy-based numerical thinking evolved from individual cognition into a dominant paradigm permeated with perception, intuition, emotion and utility, and eventually weaved a net of man and nature in ancient Chinese culture.

In this paper, we attempt to explore the construction of individual and collective numerical thinking within two frames. Namely, the first basically follows Lévi-Strauss' (1997) anthropological multi-valued logic and Lévy-Bruhl's (1995) "*principe de participation*" in *pré-logique* to give a broader overview of numerical thinking; the second, consistent with Gestalt psychology and Gentner's (1998) theories of analogy, aims to discover the deeper cognitive-psychological root for the construction of numerical schema both individually and collectively.

Construction of Individual Numerical Thinking

An Anthropological View

Lévi-Strauss (1997, p. 162) illustrates multi-valued logic anthropologically with the mysterious number 13 in Osage tribe, a member of the Siouan people formerly living in Missouri in the valleys of the Missouri and Osage rivers. For them, the number 6 belongs to the heaven and 7 to the earth; and their summation 13 on the horizon of universe is the sum of early sunlight corresponding to glorious fighting at the social level. Obviously, this thinking system functions simultaneously on different axes, of which the core lays its foundation on the similarity and proximity between different layers of objects.

Such thinking about numbers in the sense of categorization, according to Lévi-Strauss (1997, p. 74) has no distinctive difference from modern taxonomy in which proximity is used to classify those items belonging to the same system in structure and function, while similarity is used for those not attributing to the same system but sharing at least one common feature. However, Osage's multi-valued logic attempts to build up a homology (*homologie*) between nature and man, in which various significative parallelisms interact on the basis of a principle of equipollence (Lévi-Strauss 1997, p. 93, 107).

Likewise, Lévy-Bruhl (1995, p. 60) terms this logic as "*principe de participation*" in *pré-logique*, in which the cognized and imagined objects, existence and phenomena can enigmatically co-exist as they are whenever necessary. Meanwhile, they can either discharge or assimilate the perceived force, capacity, quality and power.

Following this kind of logic, Chinese ancient sages categorized the whole world into a

numerical schema of the universe systematized in *Zhou Yi* (*The Book of Changes*) symbolized in the Eight Diagrams, in which numbers weaved a boundless net: human relations, heaven's image (human body), directions, substances, animals, foliage, colors, qualities, actions, shapes, minerals, climate, utensils, farming, trades, water conservancy, tinctures, ailments, weapons, transportations and unearthliness (Yang, 2005, pp. 19-20).

In the following section, we shall discuss how the numerical schema was constructed cognitively.

A Cognitive View

Unconscious categorization.

Related cognitive research indicates that similarity/proximity cognition is the most fundamental way for human beings to know the world (Solso, MacLin & MacLin, 2004/2005, pp. 78-80). This is pioneered by Gestalt principles of visual perception, in which people tend to organize visual elements into groups or *unified wholes* when certain principles are applied *spontaneously*. Here are the Gestalt Principles[1]:

1) *Similarity* occurs when objects look similar to one another. People often perceive them as a group or pattern (*Figure 1*). Unity occurs because the triangular shapes at the bottom of the eagle symbol look similar to the shapes that form the sunburst.

2) *Proximity* occurs when elements are placed close together. They tend to be perceived as a group (*Figure 2*). The fifteen figures below form a unified whole (the shape of a tree) because of their proximity.

Figure 1

Figure 2

3) *Continuation* occurs when the eye is compelled to move through one object and continue to another object (Figure 3). The eye is compelled to move to the right to perceive the leaf.

4) *Closure* occurs when an object is incomplete or a space is not completely enclosed. If enough of the shape is indicated, people perceive the whole by filling in the missing information (Figure 4). People perceive the contours of the panda even though they are not filled in.

Figure 3

Figure 4

[1] The diagrams are taken from http://graphicdesign.spokanefalls.edu/tutorials/process/gestaltprinciples/gestaltprinc.htm, retrieved July 24, 2011.

Analogy.

If Gestalt principles of visual perception are followed at a lower level of cognition, analogy is higher in that partial similarities/proximities between different situations support further captures of parallels across different situations by the following subprocesses:

> (1) *Retrieval*: given some current situation in working memory, the person accesses a prior similar or analogous example from long-term memory; (2) *mapping*: given two cases in working memory, *mapping* consists *of aligning* their representational structures to derive the commonalities and *projecting inferences* from one to the other. Mapping is followed by (3) *evaluation* of the analogy and its inferences and often by (4) *abstraction* of the structure common to both analogs. A further process that may occur is (5) *re-representation*: *adaptation* of one or both representations to improve the match. (Gentner, 1998, pp. 107-113)

However, in the cases where the base domain possesses a conventionalized abstract schema, it seems likely that the learner will simply project this former familiar schema rather than deriving a new match. Sometimes surface similarity has a large say in initial memory retrieval.

Formation of numerical schema.

Now the authors will analyze the process of numerical thinking illustrated with the schema construction of "five". The authors argue that this construction goes through one source domain and three projected target domains (See Figure 5).

Originally, source domain and target domain are two terms coined by George Lakoff and Mark Johnson (1980). The former refers to the conceptual domain from which we draw metaphorical expressions while the latter to the one that we try to understand. Between them, a mapping exists as the systematic set of correspondences. Here, the authors mean that the source domain belongs to the easily cognized natural phenomena from which man may infer something else and the target domain is the field for a more abstract conclusion to dwell in, between which analogy serves as the bridge of mapping and projecting.

Source Domain (familiar): the natural phenomena

wu fang (five directions),
wu zhi (five fingers/toes)
wu guan (five senses)
wu ti (two arms, two legs and a head)
wu xing (the five brightest stars)
…

↓ *inner retrieval* ↑

Projecting

Target Domain 1 (less familiar): five elements/processes — the origin of the universe (evaluated and abstracted as a schema)

shui (water)

huo (fire)
mu (wood)
jin (metal)
tu (earth)

Re-representing in the form of schema projection ⟶

Target Domain 2 (in the natural world):

wu wei (the five flavors: sweet, sour, bitter, pungent, salt)
wu xiang (the five spices: prickly ash, star aniseed, cinnamon, clove, fennel)
wu cai (blue, yellow, red, white, black)
wu geng (the five watches/periods of the night)
wu du (the five poisonous creatures: scorpion, viper, centipede, house lizard and toad)

2nd Representing in the form of schema projection ⟶

Target Domain 3 (in the societal kingdom):

wu jing (the five classics: *The Book of Songs, The Book of History, The Book of Changes, The Book of Rites, and The Spring and Autumn Annals*)
wu de (the five virtues: benevolence, righteousness, propriety, wisdom, trust)
wu deng (five ranks of the nobles: duke, marquis, earl, viscount and baron)
wu guan (five kinds of officials in charge of affairs of heaven, earth, gods, civilians and other categories)
wu guo (five misfeasances in the Western Zhou Dynasty)
wu ci (appealing of the plaintiff and defendant)
wu fa (five economical penalties for slight criminals)
wu xing—the five penalties—the quintessential closely related to the cosmological phenomena

Figure 5. Process of Construction of Schema 5

In the long inferential link connecting four domains at various levels, retrieval and aligning occurs inside the items with superficial similarities (all have 5 parts in a unity) in the Source Domain and thus a new projection of the Five Elements/Processes is made, evaluated and abstracted as schema (a unity of the world) in Target Domain 1. Such a schema, once established from perception and solidified into a mystic convention, might often deviate itself from its basis no matter to what an extent it has distorted the reality. In other words, any less powerful variables could not challenge such a schema's establishment and enforcement. That's why the schema of Five Elements/Processes frames and shapes the first and second illogical re-representation in Target Domain 2 and 3. Conversely, these re-representations seem able to prove that there exists a schema governing heaven, earth and man, which constitues an argument in a circle.

Intriguing as it is, just because of the landslide error above, a multi-dimensional axis — the analogy-based numerical schema — was established. By landslide error, the authors mean that Chinese ancestors committed a fallacy in the analogical mapping. A man, for instance, has five organs on the face or five internal organs in the body and there are many other fives in the natural world, but he has no reason to parallel them with the so-called "five directions" of the

universe (because the former are natural entities while the latter are only a subjective division of the global universe), let alone to conclude that the Five Elements/Processes are the law of the universe from those finite, sometimes, fallible observations. The reality is, a multi-dimensional axis was established to interpret heaven, earth and man and produced a heavy impact on the history of ancient Chinese culture.

Similar cognitive processes occurred to other numerical schemas in that man follows the same routine: from intuitive phenomenological observation on heaven and earth, living and non-living beings to abstract mapping between different domains.

Of course, such an inferential link of analogy was not finished by a certain specific individual in intellectual history. In Section 2, the authors temporarily treat the whole group of participants as an ideal person to have a synchronical view of the cognitive construction of numerical thinking. In Section 3, we shall discuss diachronically how the numerical thinking was constructed in the form of collective representation psychologically and historically.

Construction of Collective Numerical Thinking

Illustrated with the anthropological example of how Navajo treated the number of 4 (4 bears, 4 hedgehogs, 4 squirrels, 4 tall goddesses…) in their epics, Lévy-Bruhl (1995, pp. 205-217) argued that such a "*principe de participation*" in *pré-logique* played the role of "a preset frame" which evolved into a collective representation permeating in every cognized field in this tribe such as tattooing, and animate and inanimate objects in the universe. Consequently, the number of objects was not determined by perception but by this magic frame.

Likewise, the collective representation of ancient Chinese numerical thinking, later as "a preset frame" for national thinking, involved the following factors.

Common Cognitive Platform

As analyzed above, it is quite natural for each individual to have a perception by categorization and analogy consciously or subconsciously at the earlier stage of cognition, which offered an essential common platform for a higher mysterious numerical schema to be accepted, strengthened and solidified in a community, and then as a preset cognition frame as long as sufficient natural or social factors came into existence.

To see why analogy-based numerical thinking became dominant in ancient Chinese intellectual history, we have to discuss briefly the fate of much higher, much more difficult formal logic represented by Gongsun Long (320BC—250BC) who argued that a white horse is not a horse itself.

In terms of the language of philosophy, Gongsun Long really had a deeper insight into 1) the relationship between specificness and genericness, in which the specific individual is not equal to the generic category; and 2) the relationship between referent (entity) and reference point (concept), in which the sign "white horse" is not equal to the physical white horse.

Unfortunately, this abstruse discovery in the history of Chinese philosophy remained active for only about three hundred years and then vanished until Liang Qichao, a famous scholar in the late Qing Dynasty, dug it out. This tragedy was simply out of rebuff by most Chinese

philosophers, statesmen and ordinary people who thought that it sounded completely absurd, sophistic and useless (Sun, 2006).

On the contrary, analogy-based numerical thinking heavily colored with mystic intuition enjoyed its full bloom for thousands of years, even at the contemporary age (Yang, 2006; He, 2004).

In terms of psyche, analogy-based numerical thinking was warmly welcome by most people who would not bother digesting the seemingly incomprehensible formal logic since analogy comes directly from intuitive perceptions and phenomenological inference, and everybody is primitively innate with it. With this most economical bridge between all human beings, to communicate analogically with each other would have a congenital advantage over other zigzagging thinking in winning the participants' favor.

For those thoughtful ancient sages, therefore, it was much easier to disseminate their ideas most efficiently; for most people, it was not a dilemma at all when they decided which thought should be followed, the Chinese logicians' or others' in that, psychologically, to take the shortest cut means to follow the law of economy. Hence, it is no wonder why the overwhelming majority of ancient Chinese, as they would like to accept the hexagram and the eight diagrams, would enjoy chewing Lao Zi's (1992, p. 16) gum that "the highest good is like water", and cherishing Confucius' commitment that "the wise find pleasure in water; the virtuous find pleasure in hills. The wise are active; the virtuous are tranquil. The wise are joyful; the virtuous are long-lived." (Confucius, 1992, p. 112)

Positive Historical Catalyzers

By positive historical catalyzers, we refer to those historical-political events that really contributed to construct, solidify or strengthen a certain schema.

First, cognitively, people dominated by the intermingled idea of heaven, earth and man would try to associate some similar cases with each other even though there was no necessary connection between them. Some scientifically incidental events, in the bewildered eyes of ancient Chinese, did matter a lot. To them, any important occurrences in the heaven must predict something important to happen on the earth since there is a necessary connection between them. Namely, the earth and man mirrors the Heaven. Coincidentally, certain incidents really contributed to construct, solidify or strengthen a certain schema, for example, that of "Five Elements/Processes."

Legends about the occurrence of cosmic Five Stars in ancient China, which have been proved true by a grand program launched by a team in China Science Academy (Song, 1996), may have caused Chinese ancestors to firmly believe in the magic power of the Five Processes schema :

a) The successive appearances of *wu xing* (the Five Stars: Mercury, Mars, Saturn, Jupiter and Venus) did occur in 2054 B.C.;

b) The alternate appearances of the "Five Stars" and three suns' co-arising in the heaven did take place at the period when *Jie*, the last emperor of the Xia Dynasty, was overthrown by Tang, the first emperor of the Shang Dynasty. This event was recorded in *Zhushu Jinian* (*Bamboo Historical Records*).

c) The "Five Stars" did cluster in the period of the villainous Emperor *Zhou* who ruined his own inherited *Shang* Dynasty.

These altenate or clustering appearances of *wu xing*, as one of the performances of Five Processes, were closely parallel to the alternation of emperors in the three dynasties (Xia, Shang and Zhou). Correspondingly, these events appeared able to testify the schema's universality.

Second, politically and academically, this analogy-based numerical thinking well interpreted in *The Book of Changes* had been particularly stressed for thousands of years (Mou, 2004, p. 85). In the pre-Qin dynasties, scholars would quote *I Ching* to explore the world; ministers and civilians would not act without referring to it (Hu, 1973, p. 2); during Qin and Han dynasties, the theory of Five Elements mixed with yin and yang unified the whole thought kingdom just as Emperor Qin unified most of China (Li, 1986, p. 135); during the post-Qin and Han dynasties, *The Book of Changes* had never lost its role of axis as the textbook for ancient Chinese intellectuals (Yang, 2005, p. 1). Later, it was learnt, recited, retold, quoted and reinterpreted and spread by generations of examinees in imperial examinations, whose position and wealth attracted others to learn *The Book of Changes* and other classics occupied with the same thinking mode.

Driven by the forces discussed above, the analogy-based numerical thinking germinated individually, grew up collectively in its favorable atmosphere so that it came to be dominant in the form of collective representation. That's why numerical patterns could be seen in many aspects of ancient Chinese culture.

Numbers vs. Heaven, Earth and Man

Numericalized Universe

Ancient Chinese philosophers enjoyed exploring and describing the mysterious universe—the trinity of the real world, possible world and numerals. According to Zhang (2003), numbers in ancient Chinese culture consisted of *Xiangshu* (philosophical image numbers) and *Shushu* (divination numbers), which had three intermingled basic functions—calculation, divination and philosophical interpretation—to interwine perception and intuition with emotion, space with time, heaven with earth, yang with yin.

The I Ching: The Book of Changes, whose theoretical origin could be traced back to the age of Yellow emperor (2697BC- 2599BC), mainly dealt with the mystic function of numbers. According to *I Ching*, each number (from 1 to 9) has its special meanings. The numbers 1,3,5,7,9 are odds belonging to *yang* (male) while 2,4,6,8 are evens attached to yin (female). The interaction and combination between these numbers constitute the whole world's numerous transformations:

> Therefore there is in the Changes the Great Primal Beginning. This generates the two primary forces. The two primary forces generate the four images. The four images generate the eight trigrams. The eight trigrams determine good fortune and misfortune. Good fortune and misfortune create the great field of action. (Tr. Wilhelm, 1967, pp. 318-319; Rendered into English by Cary F. Barnes)

Ideas in *The Book of Changes* offered a lot of inspiration for numerological and cosmological speculation and political and moral philosophy in later generations. Such a theory, in Wilhelm's (1967, p. 1) words, "has occupied the attention of the most eminent scholars of China down to the present day". For example, *wu xing*, the Five Elements/Processes of the whole universe, was first discussed as the cosmic schema in Chapter *Hong fan* (nine cardinals to govern a state), *Shang shu* (*The Book of History*) (cited in Zhou, 2001, p. 121).

> The Five Elements contain water, fire, wood, metal and earth. Water moists the "downs", fire burns the "ups"; wood is characterized by growing freely and peripherally; metal is easy to be transformed and earth nurtures sowing and harvesting. Furthermore, they stand for five tastes respectively: salty, bitter, sour, pungent and sweet. (Translated by the authors)

In the circle of five elements the former conquers the later, and eventually the last overpowers the first, forming an ever-lasting moving wheel to push the world forward.

Correspondingly, earlier Chinese had five *shuzheng*, (five weathers: rainy, sunny, warm, cold and windy), *wu ji* (year, month, day, celestial bodies and way of calculating time), without one of which misfortune is doomed to arrive sooner or later.

In a word, the cosmos is numerically constructed.

Numericalized Human Relations

The cosmic schema is the cardinal principle for human beings to follow. According to the *I Ching: The Book of Changes* (Fu Hsi, King Wên, the Duke of Chou, and Confucius,1967. pp. 435-436),

> [W]ith heaven and earth existing, all things then got their existence. All things having existence, afterwards there came male and female. From the existence of male and female there came afterwards husband and wife. From husband and wife there came father and son. From father and son there came ruler and minister. From ruler and minister there came high and low. When high and low had existence, afterwards came the arrangements of propriety and righteousness. The rule for the relation of husband and wife is that it should be long-enduring. (Rendered into English by Cary F. Barnes)

Meng Zi, The Works of Mencius, echoed this schema by laying a theoretical foundation for the basic five types of relations in ancient Chinese culture: emperor & ministers, parents & children, husbands & wives, young & old, and friends. The *Rites of the Zhou*, a Confucian classic compiled from Warring States (475BC-221BC) to Han Dynasty (202BC-210AD argued for "*san de*", "Three Virtues" (*zhi de*, knowing the Way; *min de*, wisdom of performing; and *xiao de*, filialness) and *san xing*, "Three Practices" (filialness for parents, friendliness for worthy persons and respect for teachers). The most typical one put forward in *Bai Hu Tong*, a political treatise (compiled in Western Han Dynasty, 202 BC- 24AD) claimed for *Sangang Liuji* (The Three Main Ropes and The Six Binding Threads),

> The Three Main Ropes (gang) are the relationships between lord and minister, between father and son, and between man and wife. The Six Binding Threads (ji) are the relationships between father and father, between older and younger brother, between clanspeople, between uncle and uncle, between teacher and teacher, and between friend and friend. The lord is the guideline for his minister, the father the guideline for his son, and the man a guideline for his wife. (Ban, 1949).

In a word, dealing with various human relations demands that everybody should follow the order of the universe, or in a modern term, the schema of universe.

The Numericalized Judiciary System

The numericalized schemas also had their deep impact on Chinese ancient judiciary ideals, practices and legal organizations in which 3 and 5 served as the *yang* (male) — generating power — to awe and punish the (potential) criminals while 8 served as the yin (female) — tenderness — to conceal or shelter those law violators with noble, official titles. Furthermore, the number Three had magic power from the trinity of Heaven, Earth and Man as Xu Shen claimed in his *Shuowen Jiezi* that it stood for the way of heaven, earth and human beings; and the Number Five is the basic cardinal movement law of the whole universe.

Firstly, ancient law-makers held a legal ideal that family concept, family morality and state ethics made a stable trinity just like a three-legged tripod caldron. Namely, the state was a big family in which the Emperor, son of heaven and earth, was the father to all the ministers and civilians. Governing a state shared the same schema as governing a family.

Secondly, in legal practices, 3, 5 and 8 stamped their figures in judgment, penalties and absolution. In Western Zhou Dynasty (c. 11th century-771BC), *San ci* (three consultations from related ministers, officials and ordinary people) and wu ting (five observations of the suspect's words, facial expression, breathing, listening and pupils) were compulsory for the judges to investigate important and difficult cases. In the Tang Dynasty (618-907) and Ming Dynasty (1368-1644), extremely criminal cases would be co-judged by three judiciary departments, called "*sansi tuishi*" and "*sansi huishen,*" respectively.

As for the schema of Five, "*zhun wu fu zhi zui*" was established in the Sui Dynasty (581-618) and ended in the Qing Dynasty. It was a legal principle of punishing the criminal and his/her relatives in five classes of different funeral dressings which indicated how consanguineously close they were to each other. The most notorious punishment system — Five Penalties, *wu xing*—refers to all the main punishments in the ancient Chinese legal system from the Xia Dynasty (about 2100 BC-1600BC) to the Qing Dynasty (1644-1911). Although there were some transitional or dramatic changes in specific penalties, it is quite obvious that the mysterious power of "5" vigorously underlay the whole feudal legal system in ancient China (Han, 2007). According to *Bai Hu Tong, wu xing* is just the imitation of Five Elements' movements: beheading follows the example of water extinguishing fire; castration, earth congesting water; picking out the kneecap, metal overcoming wood; cutting noses, wood piercing into earth; and tattooing, fire melting metal.

Concerning absolution, *ba yi* (eight considerations of punishment) originating from *ba bi li bang fa* (Eight Laws Protecting the State) in the Western Zhou Dynasty (c. 11th century-771 BC) upheld that nobles and higher officials had privileges to avoid severe penalties. Later, it was established as a legal system in the Period of Three Kingdoms, refined in Tang Dynasty, and then inherited by the following dynasties until the end of 19th century (Ye, 2002).

Interestingly enough, the chapter number in nearly all the *corpus juris* of each dynasty found its basis in the divine number 3. There were 6 chapters in *fa jing* in the Warring States Period (475 BC-221 BC), 9 chapters in Qin Dynasty (221 BC to 206 BC) and Han Dynasty (206 BC–220 AD), 18 in Three Kingdoms (220—280), 12 in Sui Dynasty (581-618), Tang Dynasty (618-907) and Song Dynasty (960–1279), with only minor changes in Ming Dynasty (1368-1644) and Qing Dynasty (1644-1911) as exceptions (6 chapters plus 1 chapter of general principles called *ming li*) (Ye, 2002).

Last but not the least, the central judiciary framework was composed of three departments: *Da Li Si* (the Highest Court), *Xing Bu* (Ministy of Penalties) and *Yu Shi Tai* (Ministry of Supervision) in the Sui, Tang, Song, Ming and Qing dynasties (Ye, 2002).

Numericalized Aesthetic Tastes

Likewise, ancient Chinese aesthetic tastes were also permeated with the schema of numbers such as 5 and 6. Heavily affected by the Theory of Five Elements/Processes, musicians classified the musical scale into five types: *jue, zheng, gong, shang, yu* in the Spring and Autumn Period and *he, si, yi, chi, gong* in Tang Dynasty, which stood for *do, re, mi, sol, la* in modern music notes. "Why do ears want *wu sheng* (five music scales)? Why do eyes need wu se (five colors)? Why do tongues enjoy wu wei (five tastes)? All is due to nature."(Li & Liu, 1984, p. 572)

The number Six, according to *I Ching*, is called Old yin (the extreme of *yin*, female), which inclines to change into *Yang* (male). Therefore, the hexagram was set up standing for six phases of changes — spatial changes of heaven (up), earth (down), East, West, South and North, and temporal changes of six pairs of months corresponding with each other, both of which were named "*liuhe*" composing the harmonious universe (Yao, 2008, p. 183). Aesthetically, beauty arises from the harmonious balanced interweaving of *yin* and *yang*, falling and rising, tenderness and vigor, exquisiteness and sublimity (Li & Liu, 1984, p. 310).

Therefore, "great masters teaches six types of poems called *liu shi*: airs (*feng*), rhapsodies (*fu*), comparisons (*bi*), moods (*xing*), odes (*ya*) and hymns (*song*) with Six Virtues as its basis and Six Temperaments as its tone " in order to moralize the people (Li & Liu 1984, p. 572).

In a word, numbers were just the unity of heaven, earth and man, the unity of fortune and misfortune, the unity of the true, the good and the beautiful in the eyes of ancient Chinese.

Summary

This paper tries to argue that the analogy-based numerical thinking underwent an evolution from individual primary cognition, representation and higher re-representation into a collective dominant paradigm catalyzed by other historical-political agents.

First, human beings have the inclination to perceive things into certain units based on

proximities and similarities (Solso, MacLin & MacLin, 2004/2005; Lévi-Strauss, 1997), which provides human beings with the possibility to categorize the objects and count them in numbers, to infer analogically, and to clarify their cognition of the world.

Second, the primitive classification with fallible analogy in the form of "*principe de participation*" in *pré-logique* or multi-valued logic endows numbers with mystic power (Cassirer, 1965; Lévy-Bruhl, 1995; Lévi-Strauss, 1997) so as to solidify individual numerical thinking.

Third, the universal analogical inference serves as the common platform for a community to make particular collective numerical re-representations catalyzed by some historical, academical and political events. The collective consciousness of ancient Chinese, consequently, solidified numerical thinking both individually and collectively by re-representing the cognized and imaginary world.

Numerical thinking, eventually, played a magnificent role in ancient Chinese culture in classifying cognized objects, constructing an ontological universe schema, soothsaying, establishing the social order and judiciary system and shaping aesthetic tastes.

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