A Chemist’s Venture into Ancient Civilizations: Oracle Bones and Hieroglyphics

As you see from the title, my talk will not be in the realm of chemistry. At Rutgers University, I am a faculty member in the Chemistry Department teaching Physical Chemistry and Chemical Biology and doing research in the areas of chemical biology and biomedical sciences. Nonetheless, I am also an adjunct Professor of Chinese language and Culture in Asian Study Program and is currently offering a course entitled “Origin and Development of Chinese Writing”. The course covers Shang civilization, oracle bone inscriptions, and other ancient languages such as Egyptian and Mayan hieroglyphics. Tonight, as Dr. David Chang (CACS) has requested, I will make a slight diversion and, instead of discussing about my research chemistry, I will talk about ancient Chinese writing, specifically oracle bone inscriptions, its discovery and scholarship and the role it plays in understanding the origin of Chinese civilization and in the world of languages. Finally I offer some thoughts on the uniqueness of Chinese language and civilization and the future of Chinese writing.

**Original Writing Systems**

Writing exists only in a civilization and a civilization cannot exist without writing. As language distinguishes man from animal, so writing distinguishes civilized man from barbarian. All the factors-geographic, social, economic-leading towards a full civilization simultaneously created a complex condition, which could not function properly without writing. The invention of writing and of a convenient system of records on paper has had a greater influence in uplifting the human race than any other intellectual achievement in the career of man. Throughout the entire history of human civilization, only five truly independent writing systems have ever been developed. They are Sumarian (in modern Iraq), Egyptian, Mayan (in central America), Harapan (northern India), and Chinese (or Hanzi). The duration and the characteristics of these five languages are listed below. Among them only Chinese survives into the modern time. All the other four have long since been dead. However, from Egyptian and Sumarian, the proto-Canaanite inscription was developed in about 1700 BC and became the precursor of all the alphabetic writings.

<table>
<thead>
<tr>
<th>Name</th>
<th>period</th>
<th>signs</th>
<th>Syllabus</th>
<th>Duration (yrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sumarian</td>
<td>3100 to 1800 BC</td>
<td>600</td>
<td>150</td>
<td>1300</td>
</tr>
<tr>
<td>Egyptian</td>
<td>3000 to 500 BC</td>
<td>700</td>
<td>100</td>
<td>2500</td>
</tr>
<tr>
<td>Harapan</td>
<td>2300 to 1200 BC</td>
<td>?</td>
<td>?</td>
<td>1100</td>
</tr>
<tr>
<td>Chinese</td>
<td>1700 BC to present</td>
<td>50,000</td>
<td>62</td>
<td>&gt;3600</td>
</tr>
<tr>
<td>Maya</td>
<td>200 BC to 1500 AD</td>
<td>500</td>
<td>50</td>
<td>1300</td>
</tr>
</tbody>
</table>

**San Dai of the Ancient China**

The three dynasties, Xia (c -1971 to -1600), Shang (c. -1600 to -1000), and Zhou (c. -1000 to -221), are called San Dai in Chinese. San Dai roughly covers a period of 2000 years in Chinese history and represents the formative stage of Chinese civilization. Although Xia and Shang were mentioned frequently in ancient texts including all Confucian canons, bamboo Annals, and Historical Record of Si Ma Qian, the lack of archaeological and coeval documentary evidence until the beginning of the last century has led to some uncertainty of their true existence. The discovery of oracle bones in Shang ruins has changed this picture. With the inscriptions on the animal bones and turtle shells, the more than 150,000 pieces of these bones and shells form the largest collection of Royal documents of Shang Dynasty and are the rich source of raw data for studying the politics, society and life of Chinese people four thousands years ago. It is really a moving experience to see the names of the ancient kings, generals (in Shang Dynasty) were inscribed on these bones and the signatures of the inscribers. In a sense, these inscribed bones and shells represent the calligraphic art work dated more than 3000 years ago.
**Discovery of Oracle Bones**

In the Historical Record, Si Maqian wrote, “From the time that PanGeng moved the Yin capital (to Xiaotun) to the time King Zhou perished (end of Shang Dynasty), for 273 years the capital was never moved again.” It was in Xiaotun that all the oracle bones and shells were excavated. The credit of discovery of oracle bone inscription was given to Wang, Yi-Rong (President of Peking University, committed suicide in 1900 during the Boxer Rebellion Incidence) in 1898. Wang first obtained small amount of these bones and shells from antique salesmen. Although many inscriptions on the bones looked like pictures, Wang and his friend, Liu E (1857-1909), were able to recognize words such as Zhu Ji, Zhu Xin and quickly became certain that these inscriptions belonged to Yin people. They identified the oracle bones as Shang artifacts. This is truly an incredible finding. Wang’s untimely death left Liu the burden to collect and compile these oracle bone inscriptions and Liu published the first collection of oracle bone inscriptions entitled "Tie Yun Cang Gui (Oracle Bone Collection of Tie Yun)" in 1903. By the way, Liu was also a famous patriot and novelist. His book, Lao Can You Ji, Travel Log of Old Can, is considered one of greatest novels at the end of Qing Dynasty. The oracle bones and shells are mostly related to Shang pyromantic theology of the Shang royal court, which was characterized by (i) the use of turtle shell and cattle scapulas (龟卜); (ii) the special processing of bones and shells for producing omen cracks; (iii) the incision of the divination records, hence oracle-bone writings. The following shows the picture of two oracle bones, with word-to-word transliteration.

![Oracle Bones](image)

**The scholarship of Jia Gu Xue (Study of Oracle Bones)**

Four major scholars, Lo Zhengyu, Wang Guowei, Dong Zuobin, and Guo Moruo are considered to be the founding fathers of the discipline of oracle bone research. Their contributions are listed as follows:

Lo, Zheng-Yu (Xue-Tang, 1866-1940): (i) identified Xiao-tun, Henan as the site where all oracle bones were excavated; (ii) collected and published a large number of oracle bone inscriptions; (iii) identified the names of many Shang Kings from oracle bone inscriptions; (iv) deciphered more than 400 characters and proposed an effective method of deciphering.

Wang, Guo-Wei (Guan-Tang, 1878-1927): (i) deciphered many important key characters; (ii) published a number of groundbreaking papers and books on Shang king list, Shang geography, Shang rituals; (iii) was the first to piece together broken oracle bones.

Dong Zuo-Bin (Yen-Tang, 1895-1963): (i) directed 15 times major Shang archeiological excavation between 1928 and 1937; (ii) discovered the names of diviners and proposed the use of the names of diviners to do oracle bones dating; (iii) reconstructed Shang calender and proposed detailed Shang sacrificial ritual cycles.

Guo Mo-Ruo (Ding-Tang, 1891-1978): (i) pioneered social anthropological studies of Shang using oracle bone documents, published 15 groundbreaking books within 14 years while being a political refugee in Japan; (ii)
initiated geographic and mythological study using oracle bone data; (iii) made important epigraphical findings; 
(iv) initiated and directed the compilation of multivolumes "Jia Gu Wen He Ji" (Collections of Oracle Bone 
Inscriptions"

The scientific excavation of Yin Xu, the last capital of Shang Dynasty, started in 1928 and ended in 1937 due to 
Sino-Japanese War. In 15 excavations during this time, over 30,000 pieces of oracle bones and shells were 

Six principles and development of Chinese writing

The oracle-bone inscriptions are the earliest body of writing we yet possess for East Asia. 
They were written in a script (Shang-dynasty script) that was ancestral to all subsequent 
forms of Chinese writing. The degree of maturity of this truly archaic writing (1600 to 1100 
BC) indicates that even earlier writing in China dated before 1600 BC remains to be 
discovered. Another amazing fact about oracle bone inscriptions is that they are closely 
related to the so-called Bronze writing (1300 to 700 BC). It refers to the formal script 
engraved in Shang and Zhou bronze vessels. Their styles were somewhere between oracle-
bone writing and Da-zhuan (500-200 BC). Da-zhuan literally means "greater seal", which 
underwent another stylistic change and became Xiao-zhuan (200 BC to present). The 
development of the Xiao-zhuan style of writing was attributed to Li Si, the famous and 
controversial prime minister of Qin Dynasty. It literally means "lesser seal". This style 
writing was used all the way to Han and later dynasties. Together with Xiao-zhuan, another 
style called Li-shu (200 BC to present), literally "Clerkly script" or script of people of lower 
status, became popular after popular after Qin dynasty. Li-shu is essentially the same as 
modern Chinese characters.

Six Principles of word construction:
Chinese is the only language in the world that is not alphabetic. The construction of 
Chinese characters rely on so called Liu-shu or six principles of word construction. They 
are: Xiang-xing (mimic the shape, pictographs); Zhi-shi (pointing to situations, simple 
ideographic words, indirect symbols); Hui-yi (meeting ideas, compound ideographic words 
whose meaning is the function of their parts, associative compounds); Zhuan-zhu 
(transferrable meaning, mutually interpretative symbols); Jia-jie (borrowing, phonetic loan 
character (rebus writing)); Xing-sheng (semantic-phonetic compound characters which 
consist of a Radical part which indicates meaning and a phonetic part which indicates 
sound, combination of sound and pictograph, determinative phonetics).

Based on the Liu-Shu principle I have written a paper arguing that the earliest Chinese 
writing originated at the time about 3000 BC.

The longevity and the continuity of Chinese writing and Chinese civilization

Chinese writing (or Chinese language) is truly unique among all the languages in the world 
in the following ways:

1) It is the only written language in human history that has been continuously used for over 
at least 4000 years without any disruption.
2) It is the only original Five that survives into the modern time.
3) It is the only original Five that did not need decipherment.
4) It is the only language in the world that is non-alphabetical.
5) It is the only written language that retains the three major components of writings, 
   namely, morphology, sound and meaning.
6) It is the language that has been used by the largest number of people in the world 
   throughout the human history.
The longevity and the continuity of Chinese Hanzi forms the basis of the theory proposed by late Professor Chang Kuang-chih that Chinese civilization is unique in its continuity, as in contrast to Western civilization.

The future of Chinese writing and Chinese language

Finally I offer some of my thoughts on Chinese language, particularly its future. I think,

1) we need to continue the archaeological search of the earlier writings from Xia Dynasty or earlier time in order to fully understand the beginning and the development of Chinese writing.
2) we need to standardize the Chinese characters in order to accomplish the digitization of all Chinese publications and establish the worldwide Chinese literature database.
3) we need to develop novel methodologies to facilitate the learning of Chinese language for non-Chinese worldwide in order to internationalize Chinese language.
4) we need to do more research to facilitate the use of Chinese in scientific writing.