

ANCIENT CHINESE PEOPLE'S KNOWLEDGE OF MACROFUNGI DURING THE PERIOD FROM 220 AD TO 589 AD

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The paper attempts to explore the knowledge of macrofungi in ancient Chinese works during the period from 220 AD to 589 AD. The meanings of the ancient Chinese characters or words on macrofungi, its naturalistic descriptions, earliest record of the cultivation, custom of eating macrofungi in Taiwan Island, the methods of cooking macrofungi dishes, the macrofungi in literature and Taoist texts, are analyzed in the process. Two earliest records about macrofungi in this period are the record of cultivating *Fu Ling* (*Wolfiporia cocos*) and practice of eating monkey head mushroom (*Hericium erinaceus*) in Taiwan Island. Two Taoist monographs are no less important in terms of scientific value and to unveil the right significance of the *Zhi* in Taoist literature which has become a symbol representing supernatural effects such as immortality with no reference to the species of the *Ganoderma* genus. Moreover, the evolvement of *Ling Zhi* (*Ganoderma lucidum*) in its final form indicates that macrofungi began to receive more attention in this period. The macrofungi in literature are not only glorified by the poets but also borrowed by them to represent virtues.

Key words: Ancient China, Fu Ling, History of science, Macrofungi, Taoism, *Zhi*

1. INTRODUCTION

Macrofungi play an important role in human life both in the West and the East. And the history of macrofungi is long and rich. In the West, written records about them date back to the period of ancient Greece. Some words about macrofungi appeared in the Western works of classical authors who wrote in Greek language and then influenced the formation of the

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corresponding Latin words. According to the text of *Deipnosophistae*, the ancient Greek dramatist Euripides (c. 480 BC-406 BC) was alleged to write an epigram on the death of the woman who had been poisoned with her children by θανασιονζ μκηταζ¹ (literally fatal fungus). The ancient Greek physician Hippocrates of Cos (c. 460 BC- c. 370 BC) noticed the medicinal properties of μυκηζ (literally fungus or mushroom) in his work *Epidemics*². The ancient Greek philosopher Aristotle (383 BC-322 BC) once took μυκηζ as an example of the things of fiery and glittering appearance³. Aristotle's pupil Theophrastus (370 BC- c. 285 BC) who succeeded his teacher in leadership of the Peripatetic school, spoke of μυκηζ⁴, υδνον⁵ (literally truffle, *Tuber cibarium*⁶), κερωνιον⁷ (literally truffle, *Tuber aestivum*⁸) and πεζιζ⁷ (literally bullfist or puff-ball, *Lycoperdon bovista*⁹) in his work *Inquiry into Plants* (also known as *Historia Plantarum*).

And later in the famous herbal work *De Materia Medica*, Pedanios Dioscorides (c. 40 AD- c. 90 AD), a Greek pharmacologist who practiced in Rome at the time of Nero, mentioned not only the poisonous μυκηταζ (literally fungus) whose toxicity could be detoxified with wine¹⁰ and the edible μυκηταζ growing out of the beds dunged and scattered with small pieces of the bark of the leuke tree¹¹, but also the αγαρικον (literally agaric) which grew in Agaria in the Sarmatia and was good for all internal disorders¹². Besides, he also recorded a method of boiling pears together with mushrooms in order to ensure the safety in eating mushrooms¹³. When it came to another great ancient physician Galen of Pergamum (131 AD- c. 199 AD), the Greek words βωλιτηζ (literally terrestrial fungus) and αμανιται (literally champignons) were mentioned in his work *De Alimentorum Facultatibus*¹⁴. If turning eyes to the ancient East, we can find the words about macrofungi in early literature as well. For example, based on the account of *R̥gVeda* (finally compiled circa 2000 BC), a thing called “*sóma*” was regarded as the creator of the Gods and given precedence above Indra (the king of the Gods) and the other Gods. Nobody knew exactly what it was until Robert Gordon Wasson (1898 AD-1986 AD) initially and convincingly identified it as *Amanita muscaria*, a poisonous and psychoactive macrofungus¹⁵. And in another Buddhist scripture *Digha Nikāya* (compiled in the 4th or 5th century AD), a thing called *sūkara-maddava*, what the Buddha had as his last meal circa 483 BC, was identified by Wasson as *Amanita muscaria* too¹⁶. In ancient China, macrofungi were mentioned in the works of a few great

philosophers or poets like Mo Di¹⁷ (c. 468-376 BC), Qu Yuan¹⁸ (340 BC-278 BC), Zhuang Zhou¹⁹ (4th-3rd century BC), Lü Bu-wei²⁰ (?-235 BC), etc. Still, the historical materials concerning macrofungi before 220 AD (when the Han Empire collapsed) are comparatively scarce if compared with the materials in later periods, at least there are no monographs on macrofungi before 220 AD.

The period from 220 AD to 589 AD is very special and interesting in Chinese history, when a unified empire in the true sense never appeared following the Han Empire (206 BC-220 AD). It's the period of civil wars and political chaos as well as cultural integration and prosperity, somewhat like the immortal saying by Charles Dickens: "It was the best of times, it was the worst of times." There are the following dynasties during this period: Three Kingdoms (the Kingdom of Wei, 220 AD-265 AD; the Kingdom of Shu, 221 AD-263 AD; the Kingdom of Wu, 222 AD-280 AD), Jin dynasty (Western Jin dynasty, 265 AD-316 AD; Eastern Jin dynasty, 317 AD-420 AD), Southern dynasties (Song dynasty, 420 AD-479 AD; Qi dynasty, 479 AD-502 AD; Liang Dynasty, 502 AD-557 AD; Chen dynasty, 557 AD-589 AD) and Northern dynasties (Northern Wei dynasty, 386 AD-534 AD; Eastern Wei dynasty, 534 AD-550 AD; Western Wei dynasty, 535 AD-556 AD; Northern Qi dynasty, 550 AD-577 AD; Northern Zhou dynasty, 557 AD-581 AD). Among the numerous Chinese historical materials, it is particularly important to distinguish the genuine ones of this period from the forged ones before studying. Furthermore, the books which were forged in this period but published in the name of the people living a few centuries ago will also be used as reference materials, for example, *The Book of Master Lie*, which is thought to be written in Jin dynasty but in the name of Lie Zi²¹ who lived in the Warring States period (475 BC-221 BC), will be referred to as the book of Jin dynasty, and the words about macrofungi in this book will be cited in this paper. Up to the present, as a part of the history of science and technology in China, there is a lack of comprehensive and systematic study in the knowledge of macrofungi in ancient China, and even Joseph Needham's *Science and Civilization in China*, which is the most famous series of the history of science and technology in China, doesn't have any special or individual chapters on the brief history of this subject. Ancient Chinese people's knowledge of macrofungi to 220 AD has already been reviewed²², and now it's time to follow the former study and put emphasis on the period

from 220 AD to 589 AD. For Chinese characters are the basis of understanding the Chinese historical materials, we might as well begin with the Chinese characters or words on macrofungi.

2. CHARACTERS OR WORDS ON MACROFUNGI IN ANCIENT CHINESE DICTIONARIES

*Literary Expositor*²³, which was finally stabilized in Qin (306 BC-207 BC) or Han (206 BC-220 AD) dynasty, is the first extant dictionary (or encyclopedia) in Chinese history. For this work was compiled from the materials of Zhou dynasty (1046 BC-256 BC) and the paraphrases were so simple, later people found it difficult to comprehend its content as time went on. Up to Jin dynasty, the great scholar Guo Pu²⁴ (276 AD-324 AD), who was a master of literature, paleography and divination at that time, not only annotated the work in detail but also illustrated it elaborately and therefore greatly facilitated people's ability to unscramble and use the dictionary. Chinese characters or words on macrofungi in *Literary Expositor* have been discussed before²², but here, Guo Pu's annotations on them will be reviewed. First, he attached importance to the pronunciations of single characters and added the pronunciations of most of the characters, including “茵,” (Pinyin: Xiu), “廌” (Pinyin: Kui) and “菌” (Pinyin: Jun)²⁵ which concern macrofungi. Second, he emphasized the evolution of the various names of the same thing. Because of this, we know that “中廌” (Pinyin: Zhong Kui; an edible mushroom) in *Literary Expositor* was then called “土菌” (Pinyin: Tu Jun) or “廌厨” (Pinyin: Kui Chu) in Guo Pu's time. Finally, he also gave descriptions to the shapes, edibility or habitats of the creatures mentioned in the work. For example, according to his annotation, “中廌” is edible, shapes like a cap and grows at least in the areas south of the Chang River²⁶. In addition, his exquisite illustrations of the creatures (including macrofungi) for *Literary Expositor* provide us with much convenience for identification²⁷.

Compared with Guo Pu's annotations, Zhang Yi, who lived in the Kingdom of Wei, had compiled three dictionaries in his life. But only the one titled 'Enlargement of the Literary Expositor'²⁸ (compiled in 230 AD) has been passed down through history. According to the literal meaning of the title, this work actually is a revised and enlarged edition of *Literary Expositor*. There're two words concerning macrofungi in this work: “茯神”²⁹ (Pinyin: Fu Shen) and “鞠菌”³⁰ (Pinyin: Zhao Jun). The former word means

“茯苓...” (Pinyin: Fu Ling; scientific name: *Wolfiporia cocos*), while the latter one means the macrofungi which grow in the morning. Additionally, the character “菌”³¹, which means cap-like edible macrofungus in *Literary Expositor*²², means “薰” (Pinyin: Xun; a plant whose scientific name is *Lysimachia foenum-graecum*) in *Enlargement of the Literary Expositor*. The latter meaning of “菌” was not widely used in history.

Another dictionary containing the characters on macrofungi is *The Forest of Characters*, which was compiled by Lü Chen in Jin dynasty. This work has not been preserved in extenso, although it was well-known in a long period since it was finished. But fortunately, there is a collected text of *The Forest of Characters* for reference. According to the collected text, two characters on macrofungi are included: “蕈...” (Pinyin: Xun) and “蕈”³² (Pinyin: Ruan). “蕈” refers to the *Auricularia* species growing on trees or rotten wood while there are no words about the meaning of “蕈”, possibly because the paraphrase of the character hasn't been passed down. However, the two characters are also included in *Analytical Dictionary of Characters*³³, a dictionary finished in 100 AD. Based on the paraphrase of “蕈” in *Analytical Dictionary of Characters*, it should refer to the *Auricularia* species growing on mulberry trees.

Among the dictionaries of this period, *Jade Page Dictionary*³⁴ is the most valuable one. And it is the first regular script dictionary in Chinese history, compiled in 534 AD, by Gu Ye-wang (519 AD-581 AD) who lived in the Liang dynasty. Later, Sun Qiang added other characters to the dictionary in 674 AD, and Chen Peng-nian (961 AD- 1017 AD) *et al* revised the dictionary in 1013 AD. The following characters are included in this dictionary: “茵”, “芝,” (Pinyin: Zhi), “菌”, “蕈”, “蕈”, “茯苓” (Pinyin: Fu) and “苓,”³⁵ (Pinyin: Ling). It's hard to know whether these characters were added by the people of later periods, but it's clear that none of them were their first time to be included. There are “茵”, “芝” and “菌” in *Literary Expositor*³⁶, “蕈” and “蕈” in *Analytical Dictionary of Characters*³³, and “茯苓” and “苓” (equals with “蕈”) in *Enlargement of the Literary Expositor*²⁹. Therefore in this paper, they are considered as the characters compiled by Gu Ye-wang himself. According to the dictionary, “茵,” and “芝,” are synonymous, both refer to the *Ganoderma* species (especially *Ganoderma lucidum*) which are thought to symbolize good fortune; “菌” and “蕈” are

synonymous, both generally refer to the macrofungi growing on the ground; “蕈” refers to the *Auricularia* species growing on rotten wood; “茯苓” and “苓,” both refer to “茯苓,” (also called “車茯苓”), the macrofungus whose scientific name is *Wolfiporia cocos*. And in the dictionary, “茯苓,” is considered as a medicinal material. As the word “茯苓,” shows, it is a compound word made up of “茯” and “苓”. And the ancient or modern Chinese people usually used the compound word to refer to *Wolfiporia cocos*, not the single characters. It’s important and interesting to notice the change in the meaning of “蕈”, which formerly refers to the *Auricularia* species growing on mulberry trees in *Analytical Dictionary of Characters* but then refers to the macrofungi growing on the ground in *Jade Page Dictionary*.

Of all the Chinese characters or words mentioned above, “芝”, “菌”, “蕈”, “茯”, “苓”, “茯苓”, “茯神” and “朝菌 (朝)菌”³⁷ are still widely used by Chinese people now, whereas the other characters or words are no longer used.

3. MACROFUNGI IN ANCIENT CHINESE NATURALISTIC WORKS

Ancient Chinese medical works, especially the herbal medicine works which give descriptions of the morphologic characteristics of the medicinal macrofungi, provide us with the most valuable source materials for identifying the scientific names of the macrofungi. In Wu Pu’s *Pharmaceutical Natural History*, which was compiled in the Kingdom of Wei, there is a plant called “鬼督郵” (Pinyin: Gui Du You; also called “神草” or “閻狗”)³⁸. According to the description, it grows in the Mount Tai or Mount Shao Shi; its stem looks like an arrow shaft, red in color, without any leaves; its root looks like the corm of *Colocasia esculenta*. Therefore Gui Du You should refer to the orchid *Gastrodia elata*, whose ‘root’ actually is a stem tuber and the small scale leaves are obviously not regarded as leaves by Wu Pu. *Gastrodia elata* is a plant that grows without roots, but the *Armillaria* species, like *Armillaria mellea* (also known as ‘honey mushroom’), can function as a mycorrhizal symbiont of the plant which gets nourishment from the mycelia of the macrofungi. The stem tubers of *Gastrodia elata* are said to be collected, sundried and stored for future use in curing abscesses. Besides, this work mentions four macrofungi: “紫芝”³⁹ (Pinyin: Zi Zhi; Zi means purple),

“茯苓”⁴⁰, “猪苓”⁴¹ (Pinyin: Zhu Ling) and “雷丸”⁴² (Pinyin: Lei Wan). With regard to *Zi Zhi*, there is no description but another name: “木芝” (Pinyin: Mu Zhi; Mu means wood). I think *Zi Zhi* should be *Ganoderma sinense*, a wood-rotting macrofungus which is purple in color. And it's quite interesting that ancient Chinese people regarded *Zhi* (including *Zi Zhi*) as a synonym for good things such as the medicinal materials keeping people immortal, for *Zhi* actually is the harmful macrofungi causing wood decay if in terms of forest protection. Fu Ling, which grows under the pine tree roots, should refer to *Wolfiporia cocos* which parasitizes the roots of conifers. Zhu Ling, whose shape looks like Fu Ling, should refer to *Grifola umbellata*. And Lei Wan, which is merely said to have another name “雷實” (Pinyin: Lei Shi), should refer to *Omphalia lapidescens*. It should be pointed out that each of the three kinds of macrofungi (Fu Ling, Zhu Ling and Lei Wan) can form sclerotia (compact mass of mycelia) and then fruiting bodies. Although this work doesn't clearly mention the sclerotia or the fruiting bodies, the fact is that the fruiting bodies grow on the ground while the sclerotia grow under the ground. So it's reasonable to consider the sclerotia of the three species as the objectives collected for medical use.

Fu Ling, Zhu Ling and Lei Wan are also mentioned in *Master Lei's Treatise on Preparing Medicinal Materials*, which is the earliest medical work putting emphasis upon preparing medicinal materials in the history of Chinese medicine, written by Lei Xiao who lived in the Song dynasty⁴³. According to its record, the process of preparing Fu Ling⁴⁴ is: peel off the skin and the ligneous part, pound the rest to a mash, transfer the mash to the basin filled with water, stir it thoroughly and then skim off the floating matter which is said to cause the constriction of the pupils of one's eyes or the blindness. For Zhu Ling⁴⁵, the process is: peel off the rough skin with a copper knife, slice the rest into thin pieces, immerse them in the water running eastward for one night, chop them fine, steam the small fragments with the leaves of *Rhizoma Cimicifugae* for one day, and then remove the leaves and dry the small fragments in the sun. And for Lei Wan⁴⁶, the process is: immerse it in the decoction of *Glycyrrhiza uralensis* for one night, peel the black skin with a copper knife, slice the rest into four or five pieces and immerse them in the decoction of *Glycyrrhiza uralensis* for one night again, steam them for four hours, dry them in the sun and then soak them in wine, steam them for four hours again and then dry them in the sun.

Moreover, this work also records the process of preparing “天麻”⁴⁷ (Pinyin: Tian Ma). Tian Ma is another name of Gui Du You (see note 38) and is more widely used by later ancient Chinese people to refer to the orchid *Gastrodia elata*. Tian Ma is an orchid plant, not a macrofungus, but its stem tubers have necessary relationship with the *Armillaria* species. So it will be mentioned in this paper but not be discussed in detail.

More kinds of macrofungi are recorded in *Additional Records of Famous Physicians* (finished circa 510 AD) and *Collected Commentaries on the Classical Pharmacopoeia* (written since 492 AD), both of which are written by the great pharmacologist and Taoist Tao Hong-jing⁴⁸ (456 AD-536 AD). In the former work, the first mentioned macrofungi are “六芝”⁴⁹ (Pinyin: Liu Zhi; “Liu” means ‘Six’). Liu Zhi refers to the six kinds of Zhi: the Green Zhi, the Russet Zhi, the Yellow Zhi, the White Zhi, the Black Zhi and the Purple Zhi, growing in Tai Mountain, Huo Mountain, Song Mountain, Hua Mountain, Heng Mountain and Gao Xia respectively. According to the Chinese mycologist Zhao Ji-ding’s study, the Green Zhi refers to *Coriolus versicolor*, the Russet Zhi refers to *Ganoderma lucidum*, the Yellow Zhi refers to *Laetiporus sulphureus*, the White Zhi refers to *Fomitopsis officinalis*, the Black Zhi refers to *Amauroderma* sp. (especially *Amauroderma rugosum*) or *Polyporus melanopus*, and the Purple Zhi refers to *Ganoderma sinense*⁵⁰. Zhu Ling⁵¹ (*Grifola umbellata*), Lei Wan⁵² (*Omphalia lapidescens*), Fu Ling⁵¹ (*Wolfiporia cocos*) and “茯神”⁵³ (Pinyin: Fu Shen) are mentioned too. The former three kinds of macrofungi have already been mentioned in the medical works above. As for Fu Shen, it specially refers to the Fu Ling which enwraps pine tree root. “馬勃”⁵⁴ (Pinyin: Ma Bo), another mentioned macrofungus growing in the garden soil rich in humus, refers to the edible species of the *Lycoperdaceae* family (e.g. *Calvatia gigantea*). “鬼蓋”⁵⁵ (Pinyin: Gui Gai), which is described to be ephemeral and look russet in color and grow under the walls, probably refers to *Coprinus micaceus*. “藟菌”, which is described to grow in the areas near the East China Sea and the Bohai Sea and the place called Zhang Wu (today’s Huang Hua city, He Bei province), refers to the *Morchella* species, e.g. *Morchella esculenta*⁵⁶. “赤箭” (Pinyin: Chi Jian), a synonym for Gui Du You, refers to the orchid *Gastrodia elata* whose stem tubers have necessary relationship with the *Armillaria* species. Besides, a medicinal material called “葶草” (Pinyin: Xun Cao) is described to grow in the marshes south of the Huai River and

be used to make salt. Xun means the macrofungi growing on the ground while Cao means herbs. If considering the habitat, Xun Cao may also refer to the morels (namely the *Morchella* species). Still, it's not known whether it refers to other organisms. In the latter work *Collected Commentaries on the Classical Pharmacopoeia*, Fu Ling⁵⁷, Zhu Ling⁵⁸, Lei Wan⁵⁹, Ma Bo⁶⁰, Guan Jun⁶¹, Chi Jian⁶², Xun Cao⁶³ and the six kinds of *Zhi*⁶⁴ are also mentioned. Just as its title implies, *Collected Commentaries on the Classical Pharmacopoeia* is a variorum edition of *Classical Pharmacopoeia*. Besides, Tao Hong-jing added some other entries of medicinal materials to the work. Take macrofungi for example, Ma Bo, Guan Jun and Xun Cao which cannot be found in *Classical Pharmacopoeia*, are included in *Collected Commentaries on the Classical Pharmacopoeia*. And compared with *Additional Records of Famous Physicians*, the description of the same macrofungus in *Collected Commentaries on the Classical Pharmacopoeia* is similar but more detailed. For example, in *Additional Records of Famous Physicians*, Ma Bo is described to grow in the garden soil rich in humus; but in *Collected Commentaries on the Classical Pharmacopoeia*, there are additional words about its biological characteristics: it looks purple in color, feel fragile and soft, shapes like a dog's lung, and releases powders with a flick. Based on this description, it can be accurately identified as *Calvatia lilacina*.

In contrary to the traditional Chinese herbal medicine works mentioned above, the traditional Chinese pharmacy works mention fewer kinds of macrofungi. *Handbook of Prescriptions for Emergency* is the first emergency medicine work in the history of traditional Chinese medicine, written by Ge Hong⁶⁵ (c. 284 AD-c. 363 AD). Of the various kinds of macrofungi, only Fu Ling, Fu Shen or Zhu Ling is used as one of the components of some prescriptions⁶⁶. In this work, there are twenty two prescriptions that contain Fu Ling, four prescriptions that contain Fu Shen and two prescriptions that contain Zhu Ling. And in another pharmacy work *Liu Juan-zi's Prescriptions Handed down by Spirits*, which was written by Liu Juan-zi and compiled by Gong Qing-xuan in 483 AD, there are only sixteen prescriptions involve using Fu Ling as one of the components, and no more kinds of macrofungi except Fu Ling are mentioned⁶⁷. The statistics indicate that Fu Ling is the most important macrofungus in traditional Chinese pharmacy works.

It's worth mentioning that there is a prescription in *Handbook of Prescriptions for Emergency* for toadstool poisoning: drink one Sheng (Sheng is a unit of capacity then; one Sheng equals to approximately 204 mL now) of liquid human excrement, take emetics or drink two or three Sheng of aqueous slurry. A similar and earlier prescription can be found in *Synopsis of prescriptions of the Golden Chamber* which was written by the medical sage Zhang Zhong-jing⁶⁸ (150 AD-219 AD). Taking emetics will help the patient vomit the residue of the toadstools. As for drinking liquid human excrement or aqueous slurry, the effect is still waiting to be checked. Actually, liquid human excrement is rich in ammonia, and ammonia water is a dissolvent for amatoxins (toxic substances produced by some toadstools), so drinking liquid human excrement would only aggregate the toxic symptom.

In other works, toadstool poisoning is also recorded in *Records of the Investigation of Things*, which was written by the great naturalist and litterateur Zhang Hua (232 AD-300 AD). The original text is: "In the mountains and prefectures south of the Chang River, macrofungi grow out of the big broken trees during spring and autumn, and these macrofungi are called '榷' (Pinyin: Shen). They taste good but poison people in an instant. Some people think the toxicity is generated by the macrofungi themselves, while some people think the toxicity comes from the snake venom. The people who have eaten the macrofungi growing on the maple trees will laugh loudly without stopping, and the treatment for them is drinking aqueous slurry."⁶⁹ Eating toadstools by mistake isn't impossible, for it's so hard to distinguish them from the edible macrofungi, even the mycologists are not absolutely certain about it. From the symptom of poisoning that he mentioned, the macrofungi growing on the maple trees seem to be a kind of hallucinogenic macrofungi. Zhang Hua didn't provide us with any valuable information about the identification of toadstools, but he noticed the growth of the wood-rotting macrofungi and especially used a Chinese character to denote them. In Shen Huai-yuan's *Record of Nanyue*, the Yin Mountain of Xiubei county (today's Huiyang county, Guangdong province) is rich in Fu Ling which grow in the soil under the pine trees⁷⁰. This is another written record about the relation between Fu Ling and the pine trees, although the essence of the relation is not unveiled due to the limitation of the age. In *The Book of Master Lie*, which is thought to be forged in Jin dynasty, macrofungi are described as growing in the soil rich in humus and decaying from morning

till evening⁷¹. The author's description somewhat exaggerates, but we know that humus supplies organic nutrients for macrofungi and the life history of some kinds of macrofungi (e.g. *Coprinus atramentarius*) is quite short indeed.

4. THE EARLIEST CONVINCING RECORD OF THE CULTIVATION OF MACROFUNGI

With regard to the records of the cultivation of macrofungi, although the earliest record seems to be the simple words about the cultivation of Zi Zhi in *Discourses Weighed in the Balance* which was written by Wang Chong (27 AD-c 97 AD), those words are not convincing⁷². Here, the earliest convincing record should be the method of cultivating Fu Ling (*Wolfiporia cocos*) which comes from Tao Hong-jing's commentary on the "Fu Ling" entry in *Collected Commentaries on the Classical Pharmacopoeia*⁵⁷. He said that the natives of Yu Zhou (today's Lianyungang city, Jiangsu province) succeeded in chopping up the pine trees to cultivate Fu Ling, although most of the cultivated sclerotia were small and had a poor quality product. And he himself once dug out a sclerotium of high quality grown on the pine tree logs which were buried by the former people over thirty years ago. The reason for the poor quality product is that the method applied by the native then was not mature enough to produce a high proportion of the sclerotia of high quality. Now the pine tree logs are still used to cultivate Fu Ling, but with the method improved from generation to generation, the cultivated sclerotia of Fu Ling are of high quality.

5. THE EARLIEST RECORD OF THE CUSTOM OF EATING MACROFUNGI IN TAIWAN ISLAND

According to *History of the Three Kingdoms*, the earliest communication between Chinese Mainland and Taiwan Island occurred in 230 AD. It records the government assignment in an effort to seek for Yi Zhou (today's Taiwan Island) and Tan Zhou in the year⁷³. The commissioned fleet carrying ten thousand soldiers didn't find Tan Zhou because of the vast distance, but the fleet reached Yi Zhou and brought back thousands of the natives. This sketchy account doesn't provide any information about the local conditions and customs of Taiwan Island at that time, but we can find them in another work *Record of the Strange Productions of Lin-hai's Soils and Waters*⁷⁴. Its author, Shen Ying (?-280 AD), is believed to have traveled

there himself due to the detailed account of Taiwan Island. *History of the Three Kingdoms* was finished after 280 AD by Chen Shou (233 AD-297 AD), whereas *Record of the Strange Productions of Lin-hai's Soils and Waters* was finished during the period from 264 AD to 280 AD. Thus, the latter work should be the extant earliest Chinese literature on Taiwan Island. There is a paragraph relating to the custom of eating Hou Tou Geng⁷⁵ ("Hou Tou" means 'monkey head'; "Geng" means 'thick soup') in Taiwan Island. It is described that the natives were fond of the thick soup of Hou Tou which was considered to taste better than the thick soup of five kinds of meat and help neutralize the effect of alcoholic drinks. There was a common saying about it: "people would rather lose one thousand-Dan (1 Dan = 26.4 kg) of foxtail mille (*Setaria italica*) than lose Hou Tou Geng to others." Here, Hou Tou refers to *Hericium erinaceus* (monkey head mushroom; also known as 'lion's mane mushroom' or 'bearded tooth mushroom'), a macrofungus whose fruiting body shapes like a monkey head. This description is the earliest written account of the macrofungus as well as the native custom of eating it in Taiwan Island.

6. SOME METHODS OF COOKING MACROFUNGI DISHES

Chinese cuisine has a long history and is full of variety. The materials used for cooking is quite rich in diversity, not to mention the dazzling cooking methods. As the extant earliest complete agriculture work that we've ever seen, *Important Arts for the People's Welfare*, which was written by Jia Si-xie⁷⁶ during the period from 533 AD to 544 AD, firstly provides us with some methods of cooking edible macrofungi in detail. A dish called "Gu Jun Yu Geng"⁷⁷ (literally 'mushroom and fish soup') can be prepared according to the following steps: cut a fish into the hunks in one *Cun* (*Cun* a unit of length then; one *Cun* equals to approximately 3 cm now), wash the earth off the mushrooms in boiling water and cut them up, bring the mushrooms to boil and then put in the hunks of fish. However, this procedure is not unchangeable. There are two other different accounts: (1) put in mushrooms at first and then fish, vegetables, rice, spring onions and fermented beans; (2) don't use boiling water to wash the mushrooms clean, and fat meat can also be added into the soup as an ingredient. Another method of preparing macrofungi dishes called "Fou Jun"⁷⁸ (literally 'boil mushrooms') is cited as follows: the mushrooms (also called *Di Ji* [地雞]) used for cooking are the

unexpanded ones whose flesh and outer layers both look white in color; the expanded mushrooms whose flesh looks black in color smell terrible and are inedible; to store the gathered mushrooms through winter, they should be washed by salt water and steamed and then dried in the shade north side of the house; to cook the fresh mushrooms, they should be washed by boiling water in order to remove the raw taste and then ripped apart, then mix the sesame oil with the small pieces of spring unions, render the oil till the pleasant flavor releases, and then add more small pieces of spring unions, fermented beans, salt, Chinese prickly ash and the ripped mushrooms to the oil, bring the soup to boil; it's best to boil the soup with fat mutton while chicken and pork are somewhat inferior. In addition to the above agaric mushrooms, Jew's ear (scientific name: *Auricularia auricula*) is also used to prepare dishes. The dish which is called "Mu Er Zu"⁷⁹ (literally 'chopped wood ear fungus'; "Mu Er" is synonymous with 'Jew's ear') and tastes tender and smooth, can be prepared as follows: gather the soft and fresh wood ear fungi which are growing on *Jujube* trees, mulberry trees, elm trees or willow trees, bring them to boil for five times so as to remove the raw taste, then transfer them to cold water and wash them clean, immerse them in sour pickle water and wash, then pick them out and chop them up into small pieces, add a few coriander and spring onions to the pieces of wood ear fungi, flavor with fermented bean juice, soy sauce and vinegar, then put in ginger and Chinese prickly ash. Another dish that involves wood ear fungi and tastes delicious can be prepared by mixing the boiled and chopped wood ear fungi with ginger and tangerine⁸⁰. Furthermore, there is a new character on macrofungi used in this work: "槲"⁸¹ (Pinyin: Qian), which refers to the wood ear fungus growing from the base of a tree. It seems that only Jia Si-xie explained the character in this way, whereas it usually refers to a piece of wood for writing⁸².

7. MACROFUNGI IN LITERATURE

When the great Chinese geographer Li Dao-yuan (c. 470 AD-527 AD) made comments on the Wu Mountain (a mountain located in the northeast of Chongqing municipality) in *Waterways Classic*, he additionally mentioned a beautiful story about Wu Mountain: "once there was a girl called 'Yao Ji', who was the youngest daughter born of the Emperor of Heaven. Unfortunately, she died before getting married. Then, her spirit

changed into grass while her body became 'Ling Zhi'. The Emperor of Heaven granted her the south side of Wu Mountain. She became sailing clouds in the morning and then changed into rains in the evening everyday."⁸³ Ling Zhi, which is called Russet Zhi in Tao Hong-jing's *Additional Records of Famous Physicians*, refers to the macrofungus whose scientific name is *Ganoderma lucidum*. This story tells us the reason why nowadays one of the twelve peaks of Wu Mountain is called Goddess Peak. However, the rudiment of the story can date back to the poem *Ghost of the Mountain* which was written by Quan Yuan (340 BC-278 BC). The poem describes the ghost of the Mountain who's waiting for her sweetheart while "picking 'San Xiu' in Wu Mountain."⁸⁴ According to Wang Yi's note, San Xiu is synonymous with Zhi which usually refers to the Russet Zhi (*Ganoderma lucidum*). Later in *Classic of the Mountains and Rivers*, which was compiled from the materials of Zhou and Western Han dynasties (1046 BC-9 AD), there is a story about the daughter of the Emperor of Heaven: "her name was 'Nü Shi'. After death, she became a plant called 'Yao Cao', whose leaves grew alternate, flowers looked yellow in color and fruits looked like dodders (*Cuscuta chinensis*). The girls who had eaten Yao Cao would be deeply loved by other people."⁸⁵ Then, in *General Anthology of Prose and Verse*⁸⁶ (compiled in 530 AD; vol. XIX), there are two pieces of Fu (a luxuriant literary form) about the story, respectively titled "Fu of the Goddess"⁸⁷ and "Fu of Gao Tang"⁸⁸ (Gao Tang is a synonym of Wu Mountain), both of which were written by Song Yü who lived in late Warring States period. *Fu of the Goddess* describes the beauty and virtue of the goddess of Wu Mountain who had a date with the king of Chu state in the king's dream, while *Fu of Gao Tang* additionally mentions the heroine's own words beyond the date: "I'm the goddess of Gao Tang. And I was willing to sleep with you when I heard that you're traveling in Gao Tang," and "I live in the dangerous places south side of Wu Mountain, become clouds in the morning and rains in the evening everyday."⁸⁹ Later in *Record of Venerable Men in Xiangyang*, which was written by the historian Xi Zao-chi (?-383 AD), the heroine's own words evolve into the following: "I'm the youngest daughter of the Emperor of Heaven and my name is Yao Ji. I died before getting married and then was granted the Wu Mountain. My spirit attached to the grass while my body became Ling Zhi. The person who has eaten it is able to date with me in his dream. I'm the goddess of Wu Mountain. I was willing to

sleep with you when I heard that you're traveling in Gao Tang."⁹⁰ Here, the story mode of the goddess of Wu Mountain has been basically finalized: she is the daughter of the Emperor of Heaven and her name is Yao Ji; she died before getting married; her body becomes Ling Zhi; she exists in Wu Mountain and becomes the goddess of Wu Mountain. In later works such as Li Dao-yuan's *Commentary on the Waterways Classic*, the story doesn't vary substantially in plot.

Inspired by Song Yü's *Fu of the Goddess*, the brilliant poet Cao Zhi (192 AD-232 AD) wrote *Fu of the Goddess of Luo River*⁹¹ in 222 AD which narrates his melancholy about the separation from the goddess of Luo River for the essential difference between him as a human being and her as a goddess. With regard to macrofungi, he wrote a piece of poem titled "Poem of Ling Zhi"⁹², using the metaphor of Ling Zhi to represent his filial piety and the great achievements of his brother Cao Pi (the first king of the Kingdom of Wei, reigned 220 AD-226 AD) in the people's livelihood. Zhi, especially Ling Zhi (*Ganoderma lucidum*) and Zi Zhi (*Ganoderma sinense*), represent the good things such as the nobility of character, the national prosperity and the medicine of immortality in ancient Chinese literature. About Ling Zhi, it is mentioned by the following poems: *Poem of Farewell to A Friend*, by Cao Zhi⁹³; *Poem of Hidden Resentment*, by Ji Kang⁹⁴ (224 AD-263 AD); *Poem of Responding to Ji Kang*, by Ji Xi⁹⁵ (Ji Kang's brother); *Ode of Picking Water Chestnuts*, by Zhang Xie⁹⁶ (?-307 AD?); *Ode for the Emperor Sima Yi*, by Cao Pi⁹⁷ who lived in Eastern Jin dynasty; *The Great Taoist's poem imparting in the evening on August the Sixteenth* (written in 365 AD), by Yang Yi⁹⁸; *Poem of the North Gully in the Luxuriant Forest*, by Xu Yuan⁹⁹ (394 AD-475 AD); *Poem of Attending the Farewell Dinner for the Imperial Edict to Yu Yu-ling*, by Liu Xiao-chuo¹⁰⁰ (481 AD-539 AD), etc. As for Zi Zhi, there are also poems mentioning it: *Poems of Immortals* (the 2nd poem), by Zou Zhan¹⁰¹ (?-c. 299 AD); *Poems of Immortals* (the 3rd and 5th), by Yu Chan¹⁰² who lived in Jin dynasty; *Poem for General Yang*, by Tao Yuan-ming¹⁰³ (365 AD-427 AD); *Imitated Poem of the Early Chinese Classical Poetry*, by Fu Zhao¹⁰⁴ (454 AD-528 AD); *Poems of Ancient Chinese Imagery* (the 1st), by Yan Zhi-tui¹⁰⁵ (531 AD-c. 595 AD); *Poem of Travelling the Kai Shan and Ding Lin Temples in Zhong Mountain*, by Shi Hong-yan¹⁰⁶ (504 AD-564 AD); etc. Another kind of macrofungus which was generally thought to prolong one's life is Fu Ling (*Wolfiporia cocos*). Wang Wei (415

AD-443 AD) once specially wrote a poem titled “Praise for Fu Ling” about it. The poem has come down as a quotation in later important works such as *Classified Materia Medica of the Dagan Reign-period*¹⁰⁷(written in 1108 AD).

8. MACROFUNGI IN TAOIST TEXTS

Taoist Patrology is the chief literature on Taoism, and its most accessible and authoritative version is photocopied and published in 1988 AD, consisting of *Taoist Patrology of Zhengtong* (compiled in 1445 AD, including 1426 texts in 5305 volumes) and *Continuation of Taoist Patrology of Wanli* (compiled in 1607 AD, including 50 texts in 180 volumes)¹⁰⁸. The texts in this large collection of Taoist literature are not all confined to Taoism itself, many written accounts about the history of science and technology in this collection have been dug out (e.g. *Science and Civilisation in China*, vol. V: *Chemistry and Chemical Technology*) and many remain to be explored. When it comes to macrofungi, fortunately, *Taoist Patrology* contains two Taoist monographs on macrofungi, respectively titled “*Methods of Cultivating Zhi*”¹⁰⁹ and “*A Treatise of Zhi of the Supreme Numinous Treasure*”¹¹⁰ (see Figs. 1 and 2).

Methods of Cultivating Zhi belongs to the ‘Practices’ class of the ‘Spirit Grotto’ part while *A Treatise of Zhi of the Supreme Numinous Treasure* belongs to the ‘Orthodox One’ supplement, both of which are in one volume. It’s difficult to determine exactly when both the Taoist texts were written, and the similar situation applies to many other Taoist texts. According to the elder scholars’ suggestions, the former text is considered to be written after

種芝草法
黃帝問曰敢問石室之文種芝法可得聞乎
曰種芝第七經內有老子曰咨爾非人皆知
生之為樂死之為惡而莫知所以自生也
千術萬藥入兆身止可得老壽十年已還數
百年已上終不能使飛行登仙上朝
天皇也木藥之善者松脂也此木生茯苓有
脂肥故也其垂實可服長草之善者榮華黃
精天門冬山薊也止宜日每服不得一日有
廢也可得百日還元其不能與天地相畢後
世方士增加其說以誤學者吾深閱之八石
九丹雲母玉漿服之當斷房室血食不能使
兆輕舉飛行乘雲也聞仙人服紫英不耶豈
空言也夫名山之陰陽精泉水之上木石之
下亦生芝曰其所稟皆山水土之精丹砂
之上黃金之上曾青之上雄黃之上皆生芝
此芝非至德感神者達而不見見而不得食
也此芝之所以能使人立仙者受此四物之
至精含天地陰陽之和氣藥養蒸之津液以
符生成其味乃神於此四物之本體也今但

Fig. 1. The first printed page of *Methods of Cultivating Zhi*



Fig. 2. The first printed page of *A Treatise of Zhi of the Supreme Numinous Treasure*

Jin dynasty¹¹¹ and the latter text is considered to be written within the period what is consistent with the time range discussed in this paper¹¹². Therefore the two Taoist texts are tentatively treated as the writings of the period from Jin dynasty to Chen dynasty.

The main text of *Methods of Cultivating Zhi* consists of 1372 Chinese characters¹¹³, describing the methods of cultivating *Zhi*: bury Zeng Qing (or Dan Sha, Huang Jin, Xiong Huang¹¹⁴) and other various substances in the north side of the East Mountain (or South Mountain, West Mountain, North Mountain) on the first day of spring (or summer, autumn, winter), then the *Zhi* (or russet *Zhi*, yellow *Zhi*, purple *Zhi*) grow out of the soil on the hundredth day, and finally pick them according to some special Taoist rituals on specific days. It is said that the People who have eaten the *Zhi* will acquire immortality, ascend into Heaven and become Taoist celestial beings. The content of *Methods of Cultivating Zhi* is proved to be probably copied from the seventh part of *Important Classic of Apperception of Supreme Purity*¹¹⁵ with slight alterations, and the methods in the text is considered to be ineffective in producing *Zhi* or even macrofungi in a broad sense¹¹⁶: first, *Zhi* is thought to be produced by putting several inorganic and organic substances in the soil in order, e.g. put realgar and sesame oil together for

the appearance of the *Zhi* on the first day of winter; second, the time for cultivating *Zhi* is the first day of spring (or summer, autumn, winter), not the period ascertained according to the life history of *Zhi*; third, the substances used for cultivating can hardly be utilized by *Zhi*; finally, *Zhi* is a wood decaying macrofungus, and the circumstance for the growth of *Zhi* is wood, not the soil beneath the ground. As for the medicinal properties of *Zhi*, there're hardly any naturalistic descriptions but fantastic effects such as rejuvenating human beings and making them become Taoist celestial beings and ascend into Heaven. Taoist mysticism is full of the text. Still, it additionally mentions that pine trees produce edible Fu Ling. Although the fact isn't so, the relation between the pine trees and the Fu Ling is showed to be noticed through apparent observation by the Taoists. Besides, *Zi Zhi* in the text is claimed to shine in the dark. Here, *Zi Zhi* in this Taoist text

Table 1: The relation between some names of the *Zhi* and the theory of the Five Elements

Five Elements	Gold	Wood	Water	Fire	Earth
Names of <i>Zhi</i>	白玉芝 (No. 4)	青玉芝 (No. 1)	黑玉芝 (No. 5)	赤玉芝 (No. 2)	黃玉芝 (No. 3)
	白帝玉芝 (No. 10)	青帝玉芝 (No. 7)	黑帝玉芝 (No. 11)	赤帝玉芝 (No. 8)	黃帝玉芝 (No. 9)
	西方芝 (No. 15)	東方芝 (No. 12)	北方芝 (No. 16)	南方芝 (No. 13)	中央芝 (No. 14)
	銅芝 (No. 39)	木芝 (No. 87)	水芝 (No. 99)	火芝 (No. 97)	土芝 (No. 36)
	金精芝 (No. 21)	木精芝 (No. 120)	水精芝 (No. 121)	火精芝 (No. 27)	石精芝 (No. 67)

Note: 1. Notice the Chinese characters in bold: “白” means white; “西” means west; “銅” means copper; “金” means gold; “青” means green; “東” means east; “木” means wood; “黑” means black; “北” means north; “水” means water; “赤” means red; “南” means south; “火” means fire; “黃” means yellow; “中” means middle; “土” means earth; “石” means stone. According to the theory of the Five Elements, white, west, copper and gold belong to the Gold element; green, east and wood belong to the Wood element; black, north and water belong to the Water element; red, south and fire belong to the Fire element; yellow, middle, earth and stone belong to the Earth element. 2. The number in the brackets refers to the serial number of the corresponding kind of *Zhi* in *A Treatise of Zhi of the Supreme Numinous Treasure*.

is surely not *Ganoderma sinense* which never shines in the dark, but the macrofungi of this kind do exist in this world, such as *Armillariella mellea* and *Armillariella tabescens*. Generally speaking, *Methods of Cultivating Zhi* is valueless in imparting the methods which can be regarded as the results of mirage. The real value of this Taoist text lies in providing us with a precious extant text and a chance to discuss the relation between Taoism and macrofungi (especially *Zhi*). Fortunately, there is another more interesting Taoist text of this period for studying together with *Methods of Cultivating Zhi*.

A Treatise of Zhi of the Supreme Numinous Treasure is a significant contribution to unveil what the “*Zhi*” in Taoist literature refers to. It consists of 4011 Chinese characters¹¹⁷ and 127 illustrations (see Figs. 3-8), describing the characteristics of 127 kinds of *Zhi* and providing each *Zhi* with an illustration. It cannot be seen as a naturalistic writing in the real sense. As it says, this text is written for people to correctly recognize and eat the various kinds of *Zhi* so that they can become Taoist celestial beings. Every kind of *Zhi* in the text is claimed to enable the persons who have eaten it to become Taoist celestial beings of different life-spans. And some names of the various kinds of *Zhi* are closely related to the theory of the Five Elements (see Table 1).

The theory of the Five Elements doesn't originate from the Taoism before Han dynasty, but it has been assimilated into Taoism and gradually become systematic after Han dynasty. The relation between some names of the *Zhi* and the theory of the Five Elements indicates the naming of the *Zhi* in the text is partly influenced by Taoism. I classify the 127 kinds of *Zhi* into 6 groups: Single umbrella-shaped macrofungi (34 kinds; see Fig. 3), Umbrella-shaped macrofungi in clusters (8 kinds; see Fig. 4), Umbrella-shaped and cup-shaped macrofungi with branches on a stalk (12 kinds; see Fig. 5), Umbrella-shaped macrofungi in layers (18 kinds; see Fig. 6), Strange umbrella-shaped and cup-shaped macrofungi (29 kinds; see Fig. 7) and Non-macrofungi (26 kinds; see Fig. 8).

By checking all the 127 illustrations, it's clear that none of the 127 kinds of *Zhi* look like the species of the *Ganoderma* genus (or even the *Ganodermataceae* family) from appearance. Most of them are umbrella-shaped and cup-shaped if regardless of whether they look normal or strange



Fig. 3. Single umbrella-shaped macrofungi¹¹⁸ (34 kinds)



Fig. 4. Umbrella-shaped macrofungi in clusters (8 kinds)



Fig. 5. Umbrella-shaped and cup-shaped macrofungi with branches on a stalk (12 kinds)



Fig. 6. Umbrella-shaped macrofungi in layers (18 kinds)

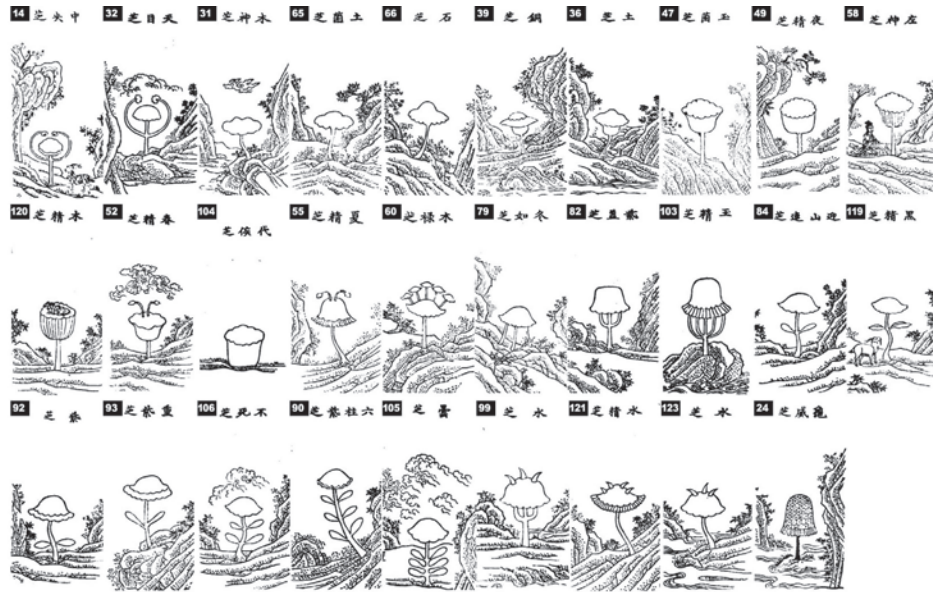


Fig. 7. Strange umbrella-shaped and cup-shaped macrofungi (29 kinds)



Fig. 8. Non-macrofungi (26 kinds)

and whether they are natural or forged. And the others (see Fig. 8 26) are not macrofungi, showing in the shapes of human being (e.g. No. 20), character (e.g. No. 88), flame (e.g. No. 28), cube (e.g. No. 18), snake (e.g. No. 42), lotus (e.g. No. 61) and the other strange things that cannot be described by words (e.g. No. 97). Here comes the question: why the 127 kinds of things are all called *Zhi*? To keep mysticism, Taoist texts are usually written in a mysterious tone deliberately. However, to make people be curious about Taoism, mysterious tone is not enough, what the texts tells about plays an important role too. The Taoists shall know what the real *Zhi* look like, but the real *Zhi* lack attraction if compared with the various kinds of “*Zhi*” in the text which are all different from the real *Zhi*. This Taoist text not only subverts the general concept of *Zhi*, but also forged some kinds of “*Zhi*” that cannot be seen as macrofungi. Besides, based on my survey of the names of the 127 kinds of *Zhi*, not every kind of *Zhi* has its unique name: there are 12 names which are used to name 28 kinds of *Zhi*¹¹⁹. I think it reveals that the author's ability of naming the various kinds of “*Zhi*” falls short in the face of his ability of forging them. *Zhi*, in terms of the Taoists, is a symbol representing immortality rather than a group of macrofungi belonging to the *Ganoderma* genus.

Although the “*Zhi*” in the text are not the *Zhi* in the real sense, the text does contain some knowledge of macrofungi. It mentions the umbrella-shaped macrofungi (usually called “mushroom”; e.g. No. 23) and the cup-shaped macrofungi (e.g. No. 104 & 49), both of which can be found in the wild. For example, *Coprinus sterquilinus* is an umbrella-shaped macrofungus; *Peziza vesiculosa* (whose fruiting bodies haven't stalks) and *Clitocybe geotropa* (whose fruiting bodies have stalks) are cup-shaped macrofungi. In the field, single umbrella-shaped macrofungi (e.g. No. 70) and umbrella-shaped macrofungi in cluster (e.g. No. 100) are quite common. We can find both single *Agaricus campestris* and the same macrofungus in cluster in the field. As for the macrofungi whose fruiting bodies grow closely together (e.g. No. 16), *Armillariella mellea* is a good example. Moreover, the No. 60 illustration reveals the parasitism among macrofungi. There is also an example for this phenomenon: *Asterophora lycoperdoides* is a parasitic macrofungus on *Russula pseudodelica*. When describing “*Zhi*” in the text, it involves some aspects including the shapes of the caps, the stalks, the branches, the leaves, the roots and the whole; the colors of the caps, the inner part, the

stalks and the leaves; the habitats and the seasons suitable for growth; the tastes and the ways of picking, preparing and eating; special effects, etc. It's obvious that most of the characteristics used to describe the shapes of the 'Zhi' are borrowed from botany. If exclude the words about the caps, the descriptions of the shapes will bring us the feeling of reading a text about wood plants (actually macrofungi don't have branches or leaves). However, it describes the colors of the inner part of some kinds of the 'Zhi', which sometimes are very important in identifying macrofungi. And from some illustrations we can see the gills of some kinds of the 'Zhi', reflecting the carefulness in the author's observation. In general, there isn't any knowledge of the real *Zhi* (the species of the *Ganoderma* genus) in *A Treatise of Zhi of the Supreme Numinous Treasure*, but it's the most important Taoist text in unveiling the relation between Taoism and macrofungi. From this text we learn that the conception of 'Zhi' in Taoist literature consists of the umbrella-shaped macrofungi (agarics), the cup-shaped macrofungi, the forged things resembling the umbrella-shaped and cup-shaped macrofungi, and the forged things that haven't any similarities with macrofungi.

Compare with the two Taoist monographs on macrofungi above, *The Inner Chapters of The Book of Master Baopu*, which was written by Ge Hong¹²⁰ (c. 284 AD-c. 363 AD), is a comprehensive Taoist work. It mentions several Taoist books titled "*Illustrations of the Celestial Zhi*"¹²¹, "*Illustrations of the Wood Zhi*", "*Illustrations of the Macrofungi Zhi*", "*Illustrations of the Meat Zhi*", "*Illustrations of the Stone Zhi*" and "*Illustrations of the Various Zhi*"¹²². Unfortunately these books on *Zhi* have not been preserved up to the present, but from the titles we know that these books were illustrated with pictures. In terms of this, these lost Taoist books just highlight the rarity of *A Treatise of Zhi of the Supreme Numinous Treasure*. With regard to the knowledge of macrofungi, the most valuable part in *The Inner Chapters of The Book of Master Baopu* is the eleventh volume, titled "Celestial Medicines". As it says, among the best celestial medicines, "*Zhu Zhi*" (literally "various kinds of *Zhi*") ranks fourth and *Fu Ling* ranks eighteenth¹²³. What's more important, it mentions the Five Groups of *Zhi*: *Shi Zhi*, *Mu Zhi*, *Cao Zhi*, *Rou Zhi* and *Jun Zhi*. Each group is said to comprise more than one hundred kinds¹²⁴. *Shi Zhi* is described as a thing without definite shapes and colors, sometimes looking like a mass of fat. It may be some of the species which grow beneath the ground, such as *Tuber sinense* and *Rhizopogon*

piceus. Mu *Zhi* is described as the “tiny trees” on *Fu Ling*. I think the “tiny trees” should be the fruiting bodies of *Fu Ling*, which grow out of the ground from the sclerotia. The description of Cao *Zhi* has been studied before and it is identified as *Tian Ma* (the orchid *Gastrodia elata*)¹¹⁶. As for Rou *Zhi* (which are described as weird toads, bats, tortoises, etc) and Jun *Zhi* (which are described as the things like palaces, carriages, horses, dragons, tigers, etc), it's obvious that they are not macrofungi. Therefore these kinds of *Zhi* are not the real *Zhi* too, which accords with the conclusion from *A Treatise of Zhi of the Supreme Numinous Treasure*.

9. CONCLUSIONS

The period from 220 AD to 589 AD, saw the rise of about eleven dynasties not to mention the short-lived regimes independent of central government on Chinese territory leading to a complete political chaos. However, this chaos of three hundred years is thought to function as a catalyst which possibly minimized cultural clashes and encouraged fusion. The cultural diversity and prosperity in Tang dynasty is a case in hand. One of the cultural features of this period is the development of Taoism which begins to thrive in the upper class and accompanies the appearance of many Taoist texts. The two Taoist monographs (*Methods of Cultivating Zhi* and *A Treatise of Zhi of the Supreme Numinous Treasure*) included in *Taoist Patrology* are of great significance to unveil what the ‘*Zhi*’ in Taoist literature really refers to. Based on the above analysis, ‘*Zhi*’ in Taoist literature is supposed to become a symbol representing supernatural effects such as immortality, no longer referring to the species of the *Ganoderma* genus. However, in terms of science, although both the titles of the monographs are so attractive, actually they are valueless in proving the truth of the methods of cultivating *Zhi* or the reliability of the taxonomy of *Zhi* of this period, which are different from the Taoist texts. For studying ancient Chinese people's knowledge of macrofungi during this period, the medical works (especially the herbal works) are really valuable for reference. Compared with the period before 220 AD, some more kinds of macrofungi are mentioned. And the most important record is that Tao Hong-jing's *Collected Commentaries on the Classical Pharmacopoeia* firstly mentions the convincing method of cultivating *Fu Ling* (*Wolfiporia cocos*). Besides, Shen Ying's *Record of the Strange Productions of Lin-hai's Soils and Waters*

firstly mentions the custom of eating monkey head mushroom (*Hericium erinaceus*) in Taiwan Island, and Jia Si-xie's *Important Arts for the People's Welfare* mentions several detailed methods of preparing macrofungi dishes. In literature, macrofungi (especially *Zhi* and *Fu Ling*) are not only glorified by the poets but also borrowed by the poets to represent virtues. Moreover, the evolvement of *Ling Zhi* (*Ganoderma lucidum*) in its final form indicates that macrofungi began to receive more attention in this period.

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8. Henry George Liddell and Robert Scott (note 6) p. 942.
9. Henry George Liddell and Robert Scott (note 6) p. 1353.
10. Pedianos Dioscorides (1829) p. 72.
11. Pedianos Dioscorides (1829) p. 109.
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14. Galen (1823) pp. 655-656.
15. Vide Robert Gordon Wasson (1968).
16. Robert Gordon Wasson and Wendy Doniger O'Flaherty (1982) 591-603.
17. Mo Di (1993) pp. 903-904. "Mo Di" is the Pinyin word of the corresponding Chinese characters "墨翟". Pinyin (literally "spell-sound") is the standard system of romanized spelling for transliterating Chinese, which has been implemented in Chinese Mainland since 1958. In this paper, the names of ancient Chinese people, places and dynasties are all written in the Pinyin manner, and so are the titles of ancient Chinese works if there aren't any appropriate English translations.
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22. Lu Di (2011) 45-62.
23. *Literary Expositor*, 爾雅 (Pinyin: Er Ya).
24. 郭璞 (Pinyin: Guo Pu). For a brief account of his life, see Fang Xuan-ling *et al.*, (1974), pp. 1899-1910. *History of the Jin Dynasty* is the official history on Jin dynasty, compiled since early Tang dynasty and finished in 648 AD.
25. Anonymous (1999) pp. 236, 256-257.
26. Anonymous (1999), pp. 256-257.
27. Guo Pu's illustrations are preserved in *Commentary on Literary Expositor with Illustrations* (爾雅音圖, Pinyin: Er Ya Yin Tu).
28. *Enlargement of the Literary Expositor*, 廣雅 (Pinyin: Guang Ya).
29. Zhang Yi (1983) p. 315.
30. Zhang Yi (1983), p. 345.
31. Zhang Yi (1983), p. 324.
32. *The Forest of Characters*, 字林 (Pinyin: Zi Lin). Lü Chen (1890).
33. *Analytical Dictionary of Characters*, 說文解字 (Pinyin: Shuo Wen Jie Zi). Xu Shen (1992) p. 36. Strictly speaking, this is the first dictionary in Chinese history. And its author, Xu Shen (in Chinese: 許慎), was a noted scholar of Confucian Classics in Eastern Han dynasty (25 AD-220 AD).
34. *Jade Page Dictionary*, 玉篇 (Pinyin: Yu Pian).
35. Gu Ye-wang (1919).
36. Anonymous (1999), pp. 236, 256-257.
37. “斡” is the variant form of “朝”. Now “斡菌” is written as “朝菌”, which is frequently cited to describe the things short-lived. This word originates from *The Book of Master Zhuang*, and the original words is “朝菌不知晦朔” (literally “the macrofungi which grow in the morning and die in the evening won't experience what a month's time is). See note 19.
38. Wu Pu (1987), p. 20. *Wu Pu's Pharmaceutical Natural History*, 吳普本草 (Pinyin: Wu Pu Ben Cao). 神草, Pinyin: Shen Cao; 閻狗, Pinyin: Yan Gou. For the various Chinese synonyms for “Gui Du You” in other ancient Chinese medical works, see Lu Di (2009) 31-34.
39. Wu Pu (2009), p. 22.
40. Wu Pu (2009), pp. 60-61.

41. Wu Pu (2009), p. 64.
42. Wu Pu (2009), p. 67.
43. *Master Lei's Treatise on Preparing Medicinal Materials*, 雷公炮炙論; Lei Xiao, 雷斅.
44. Lei Xiao (1986) pp. 31-32.
45. Lei Xiao (1986) p. 78.
46. Lei Xiao (1986) p. 113.
47. Lei Xiao (1986) p. 67.
48. Tao Hong-jing, 陶弘景 (456 AD-536 AD); *Additional Records of Famous Physicians, 名醫別錄*; *Collected Commentaries on the Classical Pharmacopoeia, 本草經集注*.
49. Tao Hong-jing (1986) p. 14.
50. Zhao Ji-ding (1989) 180-181.
51. Tao Hong-jing (1986) p. 16.
52. Tao Hong-jing (1986) p. 250.
53. Tao Hong-jing (1986) pp. 16-17.
54. Tao Hong-jing (1986) p. 267.
55. Tao Hong-jing (1986) p. 271.
56. Chen Shi-yu and Chen Qi-wu (2005) 28-34.
57. Tao Hong-jing (1994) p. 189.
58. Tao Hong-jing (1994) pp. 187-188.
59. Tao Hong-jing (1994) p. 365.
60. Tao Hong-jing (1994) pp. 383-384.
61. Tao Hong-jing (1994) p. 364.
62. Tao Hong-jing (1994) pp. 186-187.
63. Tao Hong-jing (1994) p. 379.
64. Tao Hong-jing (1994) pp. 184-186.
65. *Handbook of Prescriptions for Emergency*, 肘後備急方; Ge Hong, 葛洪.
66. Ge Hong 1781.
67. *Liu Juan-zi's Prescriptions Handed down by Spirits*, 劉涓子鬼遺方; Liu Juan-zi, 劉涓子; Gong Qing-xuan, 龔慶宣. Liu Juan-zi (1986).

68. *Synopsis of prescriptions of the Golden Chamber*, 金匱要略; Zhang Zhong-jing, 張仲景. Zhang Zhong-jing (2006) p. 120.
69. *Records of the Investigation of Things*, 博物志; Zhang Hua, 張華. Zhang Hua (1980), p. 39. A similar and earlier record about the symptom of toadstool poisoning is in *Synopsis of prescriptions of the Golden Chamber*: “The people who have eaten the macrofungi growing on the trunks of maple trees would cry ceaselessly” (2006).
70. *Record of Nanyue*, 南越誌; Shen Huai-yuan, 沈懷遠 (who lived in Song and Qi dynasties). Shen Huai-yuan (1990) p. 144.
71. Anonymous (1985) p. 156.
72. *Discourses Weighed in the Balance*, 論衡; Wang Chong, 王充. For the words about cultivating Zi Zhi, see Wang Chong (1990) p. 128. For the reasons why the record is not convincing, see note 22.
73. *History of the Three Kingdoms*, 三國志; Yi Zhou, 夷洲; Tan Zhou, 亶洲. Chen Shou (1964) p. 1136.
74. Shen Ying, 沈瑩; *Record of the Strange Productions of Lin-hai's Soils and Waters*, 臨海水土異物志.
75. Hou Tou Geng, 猴頭羹. Shen Ying (1981) pp. 4-5.
76. *Important Arts for the People's Welfare*, 齊民要術; Jia Si-xie, 賈思勰.
77. Gu Jun Yu Geng, 菰菌魚羹. Jia Si-xie (1982) p. 466.
78. Fou Jun, 鮐菌. Jia Si-xie (1982) p. 529.
79. Mu Er Zu, 木耳菹. Jia Si-xie (1982) pp. 536-537.
80. Jia Si-xie (1982) pp. 693-694.
81. Jia Si-xie (1982) p. 467.
82. Xu Shen (1992) p. 265.
83. Li Dao-yuan, 酈道元; Wu Mountain, 巫山; *Waterways Classic*, 水經; *Commentary on the Waterways Classic*, 水經注; Yao Ji, 瑤姬; Ling Zhi, 靈芝. Li Dao-yuan (1985) p. 532.
84. *Ghost of the Mountain*, 山鬼; Qu Yuan, 屈原; San Xiu, 三秀. Qu Yuan *et al.* (1983) pp. 80-81; (1981) pp. 74-76; Qu Yuan *et al.* (1999) pp. 143-150.
85. *Classic of the Mountains and Rivers*, 山海經; Nü Shi, 女尸; Yao Cao, 蓄草. Vide Anonymous (1980) p. 142.
86. *General Anthology of Prose and Verse*, 文選.
87. *Fu of the Goddess*, 神女賦. Xiao Tong (1977) p. 261.
88. *Fu of Gao Tang*, 高唐賦. Xiao Tong (1977) pp. 264-265.

89. In Jiang Wen-tong's "別賦" (literally "Fu of Departure"; in *General Anthology of Prose and Verse*, vol. XVI), however, these words were quoted by Li Shan who lived in Tang dynasty (618 AD-907 AD) to annotate one line of the Fu as follows: "I'm the youngest daughter of the Emperor of Heaven and my name is Yao Ji. I died before getting married and then existed in Wu Mountain. My spirit became grass while my body became Ling Zhi." here, the heroine has her name "Yao Ji", which is unknown in the present edition of *Fu of Gao Tang*. And the present edition of *Fu of Gao Tang* doesn't mention her body becomes Ling Zhi too. It's quite probable that Li Shan misquote or didn't literally quote the *Fu of Gao Tang*.
90. *Record of Venerable Men in Xiangyang*, 襄陽耆舊記; Xi Zao-chi, 習鑿齒. Xi Zao-chi (1986) pp. 302-305; Li Fang *et al.* (1960) p. 1844.
91. Cao Zhi, 曹植; *Fu of the Goddess of Luo River*, 洛神賦. Cao Zhi (1998) pp. 282-293.
92. *Poem of Ling Zhi*, 靈芝篇. Cao Zhi (note 91) pp. 326-329.
93. *Poem of Farewell to A Friend*, 離友詩; Cao Zhi, 曹植. Lu Qin-li (Ed.), *Poems before Tang Dynasty* (in Chinese), Beijing (1983) p. 461.
94. *Poem of Hidden Resentment*, 幽憤詩; Ji Kang, 嵇康. Lu Qin-li (1983) p. 481.
95. *Poem of Responding to Ji Kang*, 答嵇康詩; Ji Xi, 嵇喜. Lu Qin-li (1983) p. 550.
96. *Ode of Picking Water Chestnuts*, 采菱歌; Zhang Xie, 張協. Lu Qin-li (1983) p. 784.
97. *Ode for the Emperor Sima Yi*, 歌高祖宣皇帝; Cao Pi, 曹毗. Lu Qin-li (1983) p. 1071.
98. *The Great Taoist's poem imparting in the evening on August the Sixteenth*, 八月十六日夕請靈真人授詩; Yang Yi, 楊羲. Lu Qin-li (1983) p. 1121.
99. *Poem of the North Gully in the Luxuriant Forest*, 華林北澗詩; Xu Yuan, 徐爰. Lu Qin-li (1983) p. 1322.
100. *Poem of Attending the Farewell Dinner for the Imperial Edict to Yu Yu-ling*, 侍宴餞庾于陵應詔詩; Liu Xiao-chuo, 劉孝綽. Lu Qin-li (1983) p. 1828.
101. *Poems of Immortals*, 游仙詩; Zou Zhan, 鄒湛. Lu Qin-li (1983) p. 626.
102. *Poems of Immortals*, 游仙詩; Yu Chan, 庾闡. Lu Qin-li (1983) p. 875.
103. *Poem for General Yang*, 贈送羊長史詩; Tao Yuan-ming, 陶淵明. Lu Qin-li (1983) p. 979.
104. *Imitated Poem of the Early Chinese Classical Poetry*, 擬古詩; Fu Zhao, 傅昭. Lu Qin-li (1983) p. 1800.
105. *Poems of Ancient Chinese Imagery*, 古意詩; Yan Zhi-tui, 顏之推. Lu Qin-li (1983) p. 2283.

106. *Poem of Travelling the Kai Shan and Ding Lin Temples in Zhong Mountain*, 游鐘山之開善定林息心宴坐引筆賦詩; Shi Hong-yan, 釋洪偃. Lu Qin-li (1983) p. 2624.
107. Wang Wei, 王微; *Praise for Fu Ling*, 茯苓贊; *Classified Materia Medica of the Daguan Reign-period*, 大觀本草. Tang Shen-wei (2002) p. 432.
108. *Taoist Patrology*, 道藏 (Pinyin: Dao Zang); *Taoist Patrology of Zhengtong*, 正統道藏 (Pinyin: Zheng Tong Dao Zang); *Continuation of Taoist Patrology of Wanli*, 萬曆續道藏 (Pinyin: Wan Li Xu Dao Zang). “Zhengtong” and “Wanli” are both era names, referring to “1436 AD-1449 AD” and “1573 AD-1619 AD” respectively. All the texts in Taoist Patrology are divided into three parts: the “Authenticity Grotto” (mw, Pinyin: Dong Zhen) part, the “Mystery Grotto” (m,s, Pinyin: Dong Xuan) part and the “Spirit Grotto” (洞真, Pinyin: Dong Shen) part. Each part contains twelve classes: “Main Texts” (本文, Pinyin: Wen Ben), “Talismans” (神符, Pinyin: Shen Fu), “Commentaries” (玉訣, Pinyin: Yu Jue), “Diagrams and Illustrations” (靈圖, Pinyin: Ling Tu), “Histories and Genealogies” (譜錄, Pinyin: Pu Lu), “Precepts” (戒律, Pinyin: Jie Lü), “Ceremonies” (威儀, Pinyin: Wei Yi), “Rituals” (方法, Pinyin: Fang Fa), “Practices” (衆術, Pinyin: Zhong Shu), “Biographies” (記傳, Pinyin: Ji Zhuan), “Hymns” (讚頌, Pinyin: Song Zan) and “Memorials” (表奏, Pinyin: Biao Zou). Besides, there are four supplements to this classification: “Great Mystery” (太玄, Pinyin: Tai Xuan), “Great Peace” (太平, Pinyin: Tai Ping), “Great Purity” (太清, Pinyin: Tai Qing) and “Orthodox One” (正一, Pinyin: Zheng Yi).
109. *Methods of Cultivating Zhi*, 種芝草法 (Pinyin: Zhong Zhi Cao Fa). Anonymous (1988) pp. 335-336.
110. *A Treatise of Zhi of the Supreme Numinous Treasure*, 太上靈寶芝草品 (Pinyin: Tai Shang Ling Bao Zhi Cao Pin). Anonymous (1988) pp. 316-337.
111. Ren Ji-yu (Ed.) (1995) p. 697.
112. Zhu Yue-li (1996) p. 339. Furthermore, the Chinese character “恒” (Pinyin: Heng) in *A Treatise of Zhi of the Supreme Numinous Treasure* was in the form of “𠄎”, which indicates that this text was printed during the reign of the emperor “趙恒” (Pinyin: Zhao Heng; reigned 998 AD-1022 AD), for generally speaking, the Chinese characters which constitute the emperors' given names were not allowed to print as their own forms in the books in Song dynasty (960 AD-1279 AD) and the Chinese characters lacking one or several strokes were often used to substitute for their original forms. See Ren Ji-yu (note 111) p. 1116.
113. Count from “黃帝問曰” to “祚享無窮”. If add in the title “種芝草法” and the remarks “種芝草法終” that end with the text, the whole text will count up to 1381 Chinese characters.
114. Zeng Qing, 曾青 (Azurite, whose main ingredient is $\text{Cu}_3(\text{CO}_3)_2(\text{OH})_2$); Dan Sha, 丹砂 (Cinnabar, whose main ingredient is HgS); Huang Jin, 黃金 (Gold, elemental symbol: Au); Xiong Huang, 雄黃 (Realgar, whose main ingredient is As_4S_4).

115. *Important Classic of Apperception of Supreme Purity*, 上清明鑒要經 (Pinyin: Shang Qing Ming Jian Yao Jing). Anonymous (1988), pp. 420-422. *Important Classic of Apperception of Supreme Purity* is in one volume, consisting of seven parts: 作明鏡法經, 真人道士摩鏡經, “老子百華散辟兵度世方”, “仙人神酒方”, “神仙除百病枕藥方”, “老子枕中符及藥方” and 老子玉匣中種芝經神仙祕事 (Pinyin: Lao Zi Yu Han Zhong Zhong Zhi Jing Shen Xian Mi Shi; literally “the Classic of cultivating Zhi and the secrets of celestial beings in Lao Zi’s jade box”).
116. Lu Di, ‘Comment on the Taoist work ‘Methods of Cultivating Zhi’ (in Chinese). *Zhejiang Mushroom*, 18 (2010) 56-59.
117. Count from “竊以延命之術” to “食之令人不老聰明仙矣莖朱色”. If add in the title 太上靈寶芝草品” and the remarks “太上靈寶芝草品” that end with the text, the whole text will count up to 4025 Chinese characters.
118. The numbers on the top left corner of the illustrations are added in order to facilitate cataloging and comparing the 127 kinds of Zhi. Illustrations in Figure 3-8 are all from *A Treatise of Zhi of the Supreme Numinous Treasure*.
119. They are: 白玉芝 (No. 4 & 50), 北方芝 (No. 16 & 42), 木神芝 (No. 18 & 31), 金精芝 (No. 21 & 122), 木精芝 (No. 30 & 120), 土菌芝 (No. 53 & 65), 紫芝 (No. 78, 86, 92, 94, 96), 赤精芝 (No. 80 & 83), 水芝 (No. 88, 99, 123), 重紫芝 (No. 89 & 93), 科芝 (No. 95 & 98) and 水精芝 (No. 121 & 125).
120. *The Inner Chapters of The Book of Master Baopu*, 抱樸子內篇; Ge Hong, 葛洪. Ge Hong is a great Taoist scholar who called himself “Master Baopu” (namely “抱樸子”). *The Book of Master Baopu* comprises two parts: *The Inner Chapters* (in 20 volumes) and *The Outer Chapters* (in 50 volumes), both of which are considered as individual books written by Ge Hong himself. *The Inner Chapters* was written after *The Outer Chapters*. *The Inner Chapters of The Book of Master Baopu* is also included in *Taoist Patrology*, belonging to the “Great Purity” supplement. See Ge Hong (1988) pp. 171-251.
121. *Illustrations of the Celestial Zhi*, 神芝圖 (Pinyin: Shen Zhi Tu). Ge Hong (1996) p. 324.
122. *Illustrations of the Wood Zhi*, 木芝圖 (Pinyin: Mu Zhi Tu); *Illustrations of the Macrofungi Zhi*, 菌芝圖 (Pinyin: Jun Zhi Tu); *Illustrations of the Meat Zhi*, 肉芝圖 (Pinyin: Rou Zhi Tu); *Illustrations of the Stone Zhi*, 石芝圖 (Pinyin: Shi Zhi Tu) and *Illustrations of the Various Zhi*, 大魄雜芝圖 (Pinyin: Da Po Za Zhi Tu). Ge Hong (1996) p. 333.
123. Ge Hong (1996) p. 196.
124. Five Groups of Zhi, 五芝 (Pinyin: Wu Zhi); Shi Zhi, 石芝; Mu Zhi, 木芝; Cao Zhi, 草芝; Rou Zhi, 肉芝; Jun Zhi, 菌芝. Ge Hong (1996) pp. 197-202.

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