Ts'ui Fang, a Forgotten 11th-Century Chinese Alchemist

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To Doctor Joseph Needham, Fellow of the Royal Society and of the British Academy, Master of Gonville and Caius College, Cambridge, in commemoration of his visit to Japan as Visiting Professor at the Jimbun Kagaku Kenkyūsho, and Kuala Lumpur to give a public lecture on alchemy at the University of Malaya in the summer of 1971.

Old Chinese alchemists sought to compound
Elixirs giving immortality,
For with this gift, they thought, is also found
A highly prized and rare facility—
To fly at will, visit the distant moon
And planets—beyond the cerulean sky
Our modern science has brought to us a boon:
We need no secret alchemy to fly,
And borne on metal wings you come to us
To know more of the ancient sciences here,
Great Medicine, in particular, to discuss—
All this without the dark Arts of the seer.

There lived and worked eight centuries ago,
To the north of the scenic Tung-t'ing lake,
An alchemist whose scanty writings show
Relationships as close as we can make
Between the recipes of the alchemist
And medical prescriptions of the sort
Familiar to the Chinese doctor's list.
Little of him the records can report,
What we have gleaned is in this document:
Which, to the Master of Caius we present.

Chinese alchemy was in its golden age between the 4th and the 8th century, from the Chin to the T'ang dynasty, as seen from the richness of alchemical writings during this time, the lucid style employed therein as opposed to the

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abstruse language used earlier on, the adventurous spirit of the alchemists in experimenting with numerous inorganic substances, and the development of alchemical theories. The progress was arrested from the 9th century possibly as the result of a chain of T'ang emperors falling victim to elixir poisoning one after another and cases of alchemists perishing in like manner.[1] However, the enthusiasm of seeking physical immortality through the elixir can hardly be said to have subsided during the Sung period, although more caution was exercised in preparing and ingesting the Great Medicine. This idea, for example, caught the fancy of many Sung scholars and civil servants. Among the well-known *literati* of the 11th century who were acquainted with the art of alchemy were Fan Chung-yen 范仲淹 (989 to 1052) and Su Shih 蘇軾 (1036 to 1101), but there must have been many others whose names were rarely mentioned.[2] Ts'ui Fang 崔昉 belonged to the latter category.

Ts'ui Fang is indirectly known through his alchemical treatise, which has a rather interesting title *Wai-tan pên-ts'ao* 外丹本草 (Pharmacopoeia of Operative Alchemy). This book is now lost, but fragments of it are preserved in quotations made by Li Shih-chên 李時珍 in his *magnum opus*, the *Pên-ts'ao kang-mu* 本草綱目 (the Great Pharmacopoeia) (1596).[3] It is probable that Li Shih-chên has derived his material indirectly from another alchemical work, the *kêng-hsin yu-ts'ê* 庚辛玉册 (the Precious Book of Alchemy), compiled in the early 15th century by the Ming prince, Chu Ch'üan 朱權 (1378–1448). Again the *Kêng-hsin yu-ts'ê* is no longer extant, and Li Shih-chên leaves no information on Ts'ui Fang.

An alchemical compendium, the *Kêng-tao-chi* 庚道集 (Collection of Procedures of the Golden Art [Alchemy]) from the Taoist patrology *Tao-tsang* throws some light on Ts'ui Fang.[4] A certain recluse, who styled himself 'Retired Scholar' of Mêng-hsien 蒙軒, described in the year 1144 the essentials of Ts'ui Fang's alchemical pharmacopoeia and quoted the postscript written by the latter. Ts'ui Fang, according to this description, came from eastern Shantung Province. His *tzu* (style name) was Hui-shu 晦叔 and *hao* (appellation) Wên-chên Tzu 文眞子. He styled himself the 'Retired Elder of the Tsulai Mountain' (Tsulai-shan t'ui-sou 徂萊山退叟) probably towards the later stage in his life. He himself compiled a pharmacopoeia on the essentials of drugs for the Great Elixir (*Ta tan yao chüeh pen ts'ao* 大丹藥訣本草). The exact title of the pharmacopoeia does not seem to have been mentioned here, and could have been the *Wai-tan pên-ts'ao* quoted by

[1] For the Golden Age and Silver Age of Chinese alchemy see Joseph Needham, *Science and Civilisation in China* vol 5, Cambridge University Press (in press).

[2] The sociological influence of the elixir among the *literati* in T'ang and Sung China is being studied by Goh Thean Chye of the Department of Chinese Studies, University of Malaya.

[3] For a biography of Li Shih-chen see Gwei-Djen Lu, "China's Great Naturalist; a Brief Biography of Li Shih-chen," *Physis, Rivista Internazionale di storia della Scienza*, 1966, 8, 383-392.

[4] No. 946 in Wieger, L., *Le Taoisme; Bibliographie Générale*, Hsienhsien 1911. The *Kêng-tao-chih* was compiled by an unknown author not earlier than the year +1144.

Chu Ch'üan and Li Shih-chên. The postscript written by Ts'ui Fang says:

"During a *Kuei-wei* year in the Ch'ing-Li reign-period (1043) (Ts'ui) Fang took an official appointment in Hunan keeping vigilant on the *I* 夷 tribal people (inhabiting) the caves among the streams (and rivers that form the tributaries of the Yangtse River in western and southwestern Hunan). The seat of office was in Wu-kang 武岡 district, three hundred *li* away from Ch'angsha in the north-east. At that time the late minister Liu Ch'ung-chih 劉沖之 was governing T'ang-chou 潭州 prefecture. He summonded (Ts'ui) Fang (and appointed him) editor (chien-hsiu 監修).[5] Whereupon (the latter) proceeded on transfer and stayed at the Ch'ing I Ssu 青衣寺 temple. One day someone from the prefecture called Li Pi 李弼 visited him.[6] The visitor was aged seventy-odd years, (but) had a red and tender complexion (of a young child). They discussed mainly the art of making elixirs, and eventually (Li) presented (Ts'ui) a formula for making the 'Blue-Green Metal Elixir' (*ch'ing chin tan* 青金丹) of Wei, the Holy Immortal Master (Wei Chên-chün 魏眞君, almost certainly Wei Po-yang 魏伯陽).[7] (Ts'ui) Fang read and verified both the procedure and the quantity (of the ingredients involved), but was not yet able to understand its hidden subtle meaning. (Li) Pi said repeatedly that (Ts'ui) would be able to carry out (the experiment)."

"This experiment used two (parts of) sulphur and eight (parts of) mercury brought through nine cyclical changes in a Water-and-Fire reaction-vessel (*shui-huo ting* 水火鼎).[8] (The elixir) should form naturally following this method. Although (Ts'ui) Fang was burdened with official duties, he often made use of his leisure hours and carried out the experiment accordingly. (However,) after nine-cyclical changes (the product) turned back into mercury. He then asked (Li) Pi, but received no answer. (Ts'ui) Fang thought to himself that the formula was very profound and that he had failed to realise the Elixir because he could not comprehend the secret instructions of the Holy Immortals."

"Later (Ts'ui) went out travelling on an official mission and came to Hêng-shan mountain, where he visited Master Lan 藍, an adept on the nourishing of life, and sought his guidance.[9] The Venerable Lan said,

[5] Liu Ch'ung-chih was the *tzu* 字 of Liu Kang 劉沆, whose biography is given in *Sung-shih* ch. 285.

[6] We know nothing else about this adept Li Pi.

[7] *Ch'ing-chin*, the 'blue-green metal', was a synonym for lead. It is not the colour but rather the arbitrary Five-Element relationship that is being referred to. The 2 nd-century Wei Po-yang used lead as an important elixir raw material in his book *Ts'an-t'ung-ch'i* (Kinship of the Three).

[8] This is a stove for heating but with a cooling device incorporated. For the equipments used by the Chinese alchemists see Ho & Needham, "The Laboratory Equipment of the Early Mediaeval Chinese Alchemists", *Ambix*, 1959, 7, 57-115, esp. p. 89 and p. 90.

[9] We do not know exactly who the adept Venerable Lan was. Chao Tao-i 趙道一 in the *Li-shih chên-hsien t'i-tao t'ung-chien* 歷代眞仙體道通鑑 ch. 48 (Wieger No. 293) tells us about an

'This experiment is most wonderful and easiest to achieve. However, as you have not fully understood the writings of the Holy Immortals, the (quantity of) sulphur and mercury (used by you at different stages of the experiment) has not been correct. At the first cyclical operation put in two ounces of sulphur, but the amount must be decreased step by step (for every subsequent cyclical operation) until the sixth. It is at the seventh cyclical change that no sulphur is put in. As sulphur is a very Yang (substance) and mercury very Yin, they are mixed together every time in a reaction-vessel and heated by fire, and sublimation will only cease at the seventh cyclical change. At this point the substances are brought into submission (*fu* 伏).[10] Then after nine cyclical changes the product is placed in an outside combustion-chamber (*wai lu* 外爐) to be warmed by a gentle glowing fire (yang 養 lit. 'to conserve'). This involves a separate firing process. After the firing, sulphur disappears, but the mercury itself is transformed into a precious elixir'."

"It was then that (Ts'ui) Fang began to understand what was said (before) by Li Pi. Hence he bowed to thank (the Venerable Lan) again and again. Ever since he received the guidance from the Venerable Lan, (Ts'ui) Fang never failed whenever he performed the experiment."

"First and foremost, this elixir brings everlasting life, secondly, it can bring relief to people (in need), and lastly, it can enrich one's family. What must be observed is that one must do charity with a just mind and not be avaricious. The *Tao* will then be attained."

In the *Kêng-tao-chih* compendium the above post-script is immediately followed by a poem attributed to the Holy Immortal Wei, and by a commentary written by Master Lan. The poem with its commentary elucidates the gradual decrease of the quantity of sulphur used in each successive step, as already mentioned above and therefore seems to have come directly from Ts'ui Fang's pharmacopoeia. It says:[11]

When the Blue-Green Metal you will compound,
Follow the old precepts: those rules are sound.
In the reaction-vessel, actuate
The hidden fires; begin with Two-and-Eight.
First cyclical operation is through.

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adept by the name Lan Fang 藍方 (*tzu* Yuan-tao 元道), who flourished during the time of the Sung emperor Jen-Tsung (reigned 1023 to 1063) and in ch. 50 it records another called Lan Ch'iao 藍喬 (*tzu* Tzu-sheng 子升), who ate an elixir during the time of emperor Hui-Tsung (reigned 1101 to 1125). Of course there was also Lan Ts'ao-ho 藍采和, the most celebrated of them all and also a member of the famous Eight Immortals (pa hsien 八仙) in Chinese legend. However, there is no tangible clue to connect the Venerable Lan with any of these three.

[10] This must refer to fixation.

[11] Tr. auct.

Now comes the second—greatest care is due—
For at this crossroads caution is repaid:
Take heed—no alternation may be made.
A transformation, back and forth, takes place;
A marvel to behold proceeds apace.

Now at the third, a warning we must make:
Less sulphur—only half, in fact—to take.
At the fourth, maintain with the greatest care
One ounce of this Yang substance, pure and rare.
At the fifth change, this stuff is used again;
Only three-quarters, though, we must maintain.
Now comes the sixth—a rule we must announce:
To add, at this, no more than half an ounce.
At the seventh, new marvels will be brought:
The Dragon, in the chamber, will be caught.

Now at the eighth, let the quintessence be;
Let none be added: this we must decree.
At the ninth change, no secrets are concealed:
A *huan-tan* elixir—*fan-yang*—is revealed.
This sacred food is known to the elect;
Fed to the dead, this drug will resurrect.

In each cyclical change, please be aware,
The firing process must be done with care.
In each process, let no one raise a doubt,
Five pounds of charcoal must be used throughout.
To converse the luminous cinnabar
So that it resists fire, thrusts it afar—
Lead is needed for this desired end.
Mark well the true proportions of this blend:
One ounce of cinnabar, two ounces lead—[12]
No other formula will serve instead.
Melt them until they turn as white as snow;
From mixtures such as this rewards will flow.

Make offerings to Heaven and to Earth,
For of those riches you will have no dearth.
Practice charity, for thanks must be repaid

[12] The text says *ho-ch'ê* 河車 and lead. *Ho-ch'ê* ("River Chariot") was commonly used as synonym for lead, but in this case the commentary says that it meant cinnabar. In Chinese alchemy it is not usually for one synonym to have multiple meanings.

For the sacred elixir you have made,
Through whose potency, out of the mundane,
Immune from death, you ever will remain.

This experiment looks like the preparation of mercuric sulphide at the first instance, and with lead added to it oxidization could have taken place, producing lead oxide or sulphur dioxide, or else sulphur and lead could have formed lead sulphide. However, none of the above is white in colour. The white product could only be due to the impurities present in the raw material or coming over from the charcoal fuel. Nevertheless, the aspirant to immortality would have before him a substance with a strong lead, if not mercury, content. We are not informed whether Ts'ui Fang did ingest an elixir as harmful to the human body as our interpretation of his Great Experiment suggests. However, the limited use of inorganic substances as elixir ingredients, and the emphasis on mercury, sulphur and lead, were typical of the Sung *wai-tan* (operative alchemy) alchemists.

Besides the above quotation from the *Kêng-tao-chi* nothing else about Ts'ui Fang or his pharmacopoeia is found in the Taoist patrology. We have not been successful in finding anything either among the Taoist hagiographies about him. Fortunately his work received the attention of the Ming prince Chu Ch'üan and Li Shih-chên, and it is likely that they and the *Kêng-tao-chi* all referred to one and the same pharmacopoeia. Fragments of the *Wai-tan pên-ts'ao* quoted by Li Shih-chên in his *Pên-ts'ao kang-mu* are translated and reproduced below:—

"*Lu-kan-shih* (zinc-bloom, Smithsonite)[13]

Take two lbs of copper and one lb. of zinc-bloom. Heat them to form one-and-a-half lbs of *t'ou-shih* (an alloy of zinc and copper). Is it not that (the alloy) is derived from stones and minerals?

Natural *t'ou-shih* comes from Persia and looks like gold. It turns red when put to the fire and is not blackened."[14]

This passage is also repeated in Fang I-chih's 方以智 *Wu-li hsiao-shih* 物理小識 (Small Encyclopaedia of the Principles of Things) (1664).[15] However, the amount of copper used is given as one lb and the question 'Is it not that the alloy is derived from stones and minerals?' is not there. The latter could have been a remark made by Li Shih-chên himself, as there was no established practice in

[13] See Read, B. E. and Pak, C., *A Compendium of Minerals and Stones used in Chinese Medicine from the Pên-ts'ao kang-mu*, French Bookstore, Peking, 1936 (to be referred to hereafter as RP). This alloy is metioned in item number 59 in the compendium (to be abbreviated as RP 59).

[14] See *Pên-ts'ao kang-mu* ch. 9, p. 649. 1. (Our edition of the *Pen-ts'ao kang-mu* is a reproduction of the 1885 Chang-shih Wei-ku-ts'ai block-print made by the Jen-min wei-sheng she, Peking in 1957.) 用銅二斤爐甘石一斤鍊之卽成鑰石一斤半非石中物取出乎，眞鑰石生波斯，如黃金，燒之赤而不黑.

[15] See *Wu-li hsiao-shih* ch. 7, p. 23a. 銅一斤爐甘石一斤鍊之卽成鑰石其眞鑰生波斯如黃金燒之赤而不黑.

pre-modern Chinese scholarship to follow a text strictly when making a quotation from it.

"*Wu-ming-i* (pyrolusite, manganese oxide)[16]

Wu-ming-i is *Yang-ch'i-shih* (asbestos tremolite)."[17] This is most likely a misquotation, for nowhere else is the term *Yang-ch'i-shih* given as a synonym for *wu-ming-i*. The text should probably read: "*Wu-ming-i* is a Yang mineral", and it can be seen from the other quotations that Ts'ui Fang tends to try to classify all minerals into two opposite classes—Yin and Yang.

"*Tai-chê-shih* (red hematite)[18]

Tai-chê (*-shih*) is a Yang mineral. It occurred together with *T'ai-i yü-liang* (brown hematite) among mountain gorges. It is ground into a red (pigment) that can be used for (putting punctuation) marks (or writing notes) on books and also for painting over metals to produce a richer red colour."[19]

"*Chin-ya-shih* (iron pyrites)[20]

Chin-ya-shih is a Yang mineral. It occurred among the mountains in (the provinces of Sze) chuan and Shen(si). In appearance it resembles *mi-li-tzu* (a kind of limestone). That with golden dots is superior."[21]

"*Hsiao-shih* (saltpetre; Epsom salts)[22]

Hsiao-shih is a Yin mineral. This is not a kind of stone, but is obtained by the decoction of native salts. It is now called *yen-hsiao*. People of Shang-ch'êng in Hopei (province) and those living along the banks of the (Yellow) River from (the former land of) Wei (State) (*i.e.* north Honan province) to Huai (the region bordering the former States of Ch'i and Ch'u, *i.e.* Shantung province) produce it by refining native salts in solution that they collect from the ground. This is slightly different from *p'u hsiao* (crude Glauber's salt), and is not produced in the southern region (of China)."[23]

"*T'u-k'uai* (hare mallow, *Eranthis pinnatifida*, Maxim)[24]

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[16] See RP 61.

[17] See *Pen-ts'ao kang-mu* ch. 9p. 650. 1. 無名異陽起石也. *Yang-ch'i-shih* is actinolite (see RP 29) or asbestos tremolite (see RP 75).

[18] See RP 78.

[19] *Pên-ts'ao kang-mu* ch. 10 p. 664. 1. 代赭陽石也，與太一餘糧並生山峽中，研之作朱色可點書，又可鍍金益色赤.

[20] See RP 98.

[21] *Pen-ts'ao kang-mu* ch. 10 p. 678. 1. 金牙石，陽石也，生川陝山中，似蜜栗子，有金點形者妙.

[22] *Hsiao-shih* is saltpetre (RP 125), but it also referred to Epsom salts $MgSO_4 \cdot 7H_2O$ in the past as identified in a T'ang sample preserved in the Shōsōin. See Masutomi Junosuke 益富壽之助 *Shōsōin yakubutsu o chushin to suru kodai sekiyaku no kenkyū* 正倉院葯物を中心とする古代石藥の研究 (A Study of Ancient Mineral Drugs based on the Drugs preserved in the Shōsōin), Kyoto, 1957.

[23] *Pên-ts'ao kang-mu* ch. 11. p. 697. 1. 消石，陰石也，此非石類，乃鹹鹵煎成，今呼焰消，河北商城及懷衛界，沿河人家，刮鹵淋汁煉就，與朴消小異，南地不產也.

[24] See Read, B. E., *Chinese Medicinal Plants from the Pen-ts'ao kang-mu*, French Bookstore, Peking, 1936 plant no. 535 (abbreviated here as R535).

T'u-k'uai is also called *lei-wan-ts'ao*"[25]

"*Chin-hsing-ts'ao* (*Polypodium hastatum*, Th.)[26]

Chin-hsing-ts'ao controls (*chih*) the three yellow substance (sulphur, realgar and orpiment), cinnabar, mercury and potash alum."[27]

"*Ju-hsiang* (terebinth tree, *Pistacia Khinjuk*, stocks.)[28]

Ju-hsiang, when liquidized after being heated together with and brought under submission (*fu*) by leek seeds (*Allium odorum*, L.), Chinese small onion (*Allium fiotulosum*, L.) and garlic (*Allium sativum*, L.), cushions (lit. softens) (the therapeutic effects of) the Five Metals."[29]

"*Tsao-chia* (soap bean tree, *Gleditschia sinensis*, Lam.)[30]

Tsao-chia is also known by the name *hsüan-tao* (lit. 'hanging knife')."[31]

In two other instances Li Shih-chên mentions the 'prescriptions of alchemy' in one place and the 'practitioners of alchemy' in another. The former refers to the plant *ti yü* 地榆 (*Sanguisorba officinalis*, L.) saying that according to the 'prescriptions of alchemy (wai-tan-fang 外丹方) *ti yü* has an alternative name *suan chê* because of its sour taste and its brown colour.[32] The latter deals with another plant *teng hsin ts'ao* 燈心草 (*Juncus effusus*, L.) or common rush, which the 'practitioners of alchemy' (wai-tan-chia 外丹家) employ for subduing sulphur and cinnabar.[33] However, we are unable to say whether either of the two terms 'wai-tan-fang' and 'wai-tan-chia' refers to the *Wai-tan pên-ts'ao* of Ts'ui Fang.

From the fragments of Ts'ui Fang's alchemical pharmacopoeia we can detect a very important principle that seems to underlie the composition of Chinese elixirs. There appears to be a very close connection between elixir formulae and medical prescriptions. The first indication of this comes from the use of the term *pên-ts'ao* (pharmacopoeia) by Ts'ui Fang and the inclusion of alchemical material in a number of important pharmacopoeias beginning from the earliest *Shen Lung pên-ts'ao ching* 神農本草經 to the *Ch'ung-hsiu Chêng-Ho ching-shih chêng-lei pei-yung pên-ts'ao* 重修政和經史證類備用本草 and the *Pên-ts'ao kang-mu*. In all of them elixir materials are classified under the first of three categories—shang p'in 上品. One cannot also imagine Li Shih-chên making references to so many Taoist alchemical writings in the *Pên-ts'ao kang-mu* after his frequent condemnation of elixir-eating if he was not concerned only with the medicinal value of the information he collected from them.[34]

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[25] *Pên-ts'ao kang-mu* ch. 16, p. 905. 2. 菟葵又名雷丸草

[26] See R809.

[27] *Pên-ts'ao kang-mu* ch. 20, p. 1078. 1. 金星草制三黃砂汞礬石.

[28] See R313.

[29] *Pên-ts'ao kang-mu* ch. 34, p. 1371. 2. 乳香以韭實葱蒜煅伏成汁，最柔五金.

[30] R387.

[31] *Pên-ts'ao kang-mu* ch. 35B. p. 1403. 2. 皁莢又名懸刀.

[32] See R460 and *Pên-ts'ao kang-mu* ch. 12B p. 753. 2.

[33] See R696 and *Pên-ts'ao kang-mu* ch. 15. p. 890. 1.

[34] See for example Ho & Needham, "Elixir Poisoning in Mediaeval China." *Janus*, 1959, **48**, 221–251.

Secondly, one is often reminded of the fact that celebrated alchemists like Ko Hung 葛洪, T'ao Hung-ching 陶弘景, Sun Ssu-mo 孫思邈 and Mêng Shên 孟詵 were at the same time great experts in medicine. Nothing can be more illuminating than the following words of Yen Kuang-lu 顏光祿 quoted in the *Pên-ts'ao kang-mu*:[35]

> "In all the recipes of the immortals contained in Taoist writings, including those on the ingestion (of elixir substances), the way to abstain from cereals, how to attain longevity and to avert (the natural process of) ageing, and even those concerning the wonders of preparing elixirs by sublimation and working with the minerals and the marvels of ascending to the clouds and ethereal transformation into (immortals with) wings, are all dependent on the use of medicinal substances. The principle of employment of these substances is one and the same as that used in the pharmacopoeias."

We are therefore led to think that elixir formulae were composed in the same manner as medical prescriptions.

Ts'ui Fang, in his pharmacopoeia, classifies alchemical substances into the two opposite categories Yin and Yang. The theory of the two fundamental forces Yin and Yang is indeed one of the basic concepts in Chinese medicine. Further such classification of alchemical substances is found in the *Kêng-hsin yü-ts'ê* that we mentioned earlier. We are able to emend at least one case where the text of the *Wai-tan pên-ts'ao* quoted in the *Pên-ts'ao kang-mu* was corrupt on the basis of this division.

If our assumption of the similarity between elixir formulae and medical prescriptions is correct, then it will be necessary to revise our understanding of the technical terms used in alchemical writings such as *chih* 制 (control) *fu* 伏 (subdue), which have been in the past interpreted from the alchemical point of view as 'fixation'. While we cannot dismiss the logic behind this alchemical interpretation altogether, we feel that in certain cases these terms were meant by the alchemists to explain the pharmaceutical action that one component has on another in a particular elixir formula. It will not be possible for us, otherwise, to explain how the terebinth tree can 'soften' (*ju* 柔) metals, as mentioned above in the *Wai-tan pên-ts'ao*. Similar action on the metals by fats of various animals, such as goat, horse and camel is also mentioned in the *Tan-fang chien-yuan* 丹方

[35] Tr. auct.; ch. 1A p. 357. 1. Kuang-lu is most likely an official title rather than the personal name or the style of a person. Here Li Shih-chen probably refers to Yen Chih-t'ui 顏之推 who served the Northern Ch'i dynasty towards the end of the 5th century, since in the bibliography of his *Pen-ts'ao kang-mu* only the works of two persons by the surname Yen are mentioned, namely Yen Chih-t'ui and Yen Shih'ku 顏師古, and with the former the more likely candidate, judging from the specialisation of the two. Unfortunately Yen Chih-t'ui did not hold the official title as mentioned under the Pei Ch'i and though he served under the subsequent dynasties no mention of him can be found in the official dynastic histories apart from that of the Pei Ch'i.

鑑源 and quoted in the *Pên-ts'ao kang-mu*.[36] It is difficult to interpret this either in the physical or the chemical sense. The only possible explanation seems to lie in the medical prescriptions. Thus we can only determine whether such terms should be interpreted from the alchemical or the pharmaceutical sense from the context itself.

In Ts'ui Fang we find an example of a junior civil servant who acquired and practised the art of experimental alchemy. We have already come across the Education Officer Lu T'ien-chi 盧天驥 who presented to the throne a very important text on alchemical theory of category, the *Ts'an-t'ung-ch'i wu-hsiang-lei pi-yao* 參同契五相類秘要, in the early part of the 12th century.[37] Another junior-ranking administrator in the person of the celebrated poet Lu Yu 陸游 (1125–1209) was also an adept in the secret art and had personally prepared the gold elixir.[38] Lu Yu has also mentioned the names of several other Sung civil servants who succeeded in the great venture. In Sung China one may get the impression that the school of *nei-tan* 內丹 or respiratory exercises and meditation has taken over from the school of *wai-tan* 外丹 or operative alchemy. It has been pointed out elsewhere that a number of books on operative alchemy were still produced during Sung China and that they are characterised by their illustrations of alchemical laboratory equipment and apparatus.[39] Ts'ui Fang helps to show that there were many government officials, who themselves were acquainted with operative alchemy and some of whom even did the experiments themselves. Operative alchemy must have been still quite prevalent in Sung China. Often it went hand in hand with respiratory exercises and meditation, and although certain aspirants of physical immortality showed their preference for one form over the other they were probably knowledgeable in both the techniques.

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[36] Ch. 50A p. 1726. 2; Ch. 50B p. 1742. 2 and p. 1749. 2.

[37] See Ho & Needham, "Theories of Categories in Early Mediaeval Chinese Alchemy", *Journal of the Warburg and Courtauld Institutes*, 1959, **22**, 173–210.

[38] See Ho Peng Yoke, Goh Thean Chye and Beda Lim, "Lu Chi, the poet-alchemist", *Occasional Paper 13*, Faculty of Asian Studies, the Australian National University, 1972.

[39] This subject is dealt with in Ho & Needham, "The Laboratory Equipment of the Early Mediaeval Chinese alchemists", *Ambix*, 1959, **7**, 57–115.