

ELIXIR POISONING IN MEDIEVAL CHINA<sup>1</sup>

[1959]

AMPLE evidence shows that the belief in the existence of certain substances in Nature, or elixirs prepared from them, which would prolong human life for an indefinite period, flourished in the minds of Chinese alchemists and pharmaceutical adepts as early as the Warring States period (-480 to -221). But it was most ironical that in their pursuit of longevity many of them reaped just the opposite result from their preparations, since some of their elixirs (especially in the Chin and Thang periods, i.e. from the +3rd to the +10th centuries) contained substances such as mercury, lead and even arsenic. It is our purpose here to discuss elixir poisoning, its repercussions and the counter-measures for its prevention taken by the Chinese alchemists themselves.

The dynastic histories inform us about many emperors and high officials who sought for the elixir of life and some who took the preparations offered to them by their alchemists. One of the oldest examples of such an elixir is that mentioned in the *Chan Kuo Tshê* (Records of the Warring States), a book compiled not later than the Chhin period (-255 to -206). The event referred to would have occurred in Chhu State during the reign of King Ching Hsiang between -294 and -261. This dating is assured by the existence of an almost identical version of the story in the *Han Fei Tzu* book which belongs without doubt to the early part of the -3rd century. It says:<sup>2</sup>

Once upon a time someone presented an elixir of life (*pu ssu chih yao*) to the Prince of Ching. As the chamberlain was taking it into the palace the guard at the gate asked if it was edible and when he answered yes, the guard took it from him and ate it. The Prince was [extremely]<sup>3</sup> annoyed and condemned the guard to death. But the latter sent a friend to persuade the Prince, saying, 'After all the guard did ask the chamberlain whether it could be eaten before he ate it. Hence the blame attaches to the chamberlain and not to him. Besides what the guest presented was an elixir of life, but if you now execute your servant after eating it, it will be an elixir of death [and the guest will be a liar]. Now rather than killing an innocent officer in order to demonstrate a guest's false claim, it would be better to release the guard.' So the Prince let him off.

<sup>1</sup> A contribution to *Janus*, 1959, 48, 221.

<sup>2</sup> *Chan Kuo Tshê*, ch. 5, p. 33b.

<sup>3</sup> The parts within square brackets are found only in the *Han Fei Tzu* (ch. 22, p. 5b). See also Liao Wên-Kuei's (1939) translation, p. 235.

This passage was no doubt preserved as an exercise in sophistic argument, but it takes its place among a whole series of texts of an alchemical or quasi-alchemical character which establish the origins of Chinese alchemy in the Warring States period from at least the time of Tsou Yen onwards.<sup>1</sup>

One of the earliest examples of the use of mineral preparations leading to illness is contained in the biography of Shunyü I (- 216 to c. - 150).<sup>2</sup> It describes a certain Sui, personal physician to the Prince of Chhi, who himself prepared medicines from the five minerals and took them, but died of ulcers (*chü*) in the chest after 100 days just as Shunyü I predicted.

A clear case of elixir poisoning is that of the Chin emperor Ai Ti,<sup>3</sup> who, as the result of his efforts to avoid growing old, died in his very prime aged only 25. According to the *Chin Shu* (History of the Chin Dynasty):<sup>4</sup>

He had a liking for the art of the alchemists. He abstained from cereal grains, but consumed elixirs. As the result of an overdose he was poisoned and no longer knew what was going on around him (*pu shih wan chi*).

In another example we have a case of an emperor who lost his life indirectly due to elixir poisoning. The *Hsü Thung Chih* (Supplement of the Historical Collections)<sup>5</sup> says:

Deluded by the sayings of the alchemists, Thang Hsien Tsung<sup>6</sup> ingested gold elixirs and his behaviour became very abnormal. He was easily offended by those officials whom he daily met, and thus the prisons were left with little vacant space. (Finally) at midnight on a *kêng-tzu* day in the first month of the 15th year (of the Yuan-Ho reign-period) (14th Feb., + 820) Wang Shou-Chhêng and a Palace Attendant (*nei chhang shih*) Chhen Hung-Chih assassinated the emperor in the Chung-Ho Palace Hall.

Li Shun had been a good and capable ruler who had introduced many reforms, and successfully preserved the unity of the empire in civil wars from + 814 onwards. But a little later he came under the influence of an alchemist named Liu Pi, who had been recommended by a high official Li Tao-Ku. In + 819, after the emperor had for some time been consuming Liu Pi's preparations, an official

<sup>1</sup> Cf. *SCC*, vol. 2, p. 232. We shall deal fully with this evidence, which is of outstanding interest for comparison with Bolus of Mendes, Pseudo-Democritus and the Graeco-Egyptian mystical proto-chemists, in *SCC*, vol. 5. [See Figs. 87, 88, 89, 90, 91, pls, 92.]

<sup>2</sup> Cf. *Shih Chi*, ch. 105, pp. 21 b, 22 a, and Hübotter (1927), p. 21 (case 22).

<sup>3</sup> Reigned + 361 to + 366; personal name Ssuma Phei.

<sup>4</sup> Ch. 8, p. 8 a.

<sup>5</sup> Ch. 575, p. 1 a.

<sup>6</sup> Reigned + 805 to + 820; personal name Li Shun.

of the postal service, Phei Lin, presented a memorial which afterwards became a classic in its genre. Here we give it in abridged translation:<sup>1</sup>

May it please your Majesty: I have heard that he who eradicates evil, himself reaps advantage in proportion to his work; and that he who adds to the pleasure of others, himself enjoys happiness. Such was ever the guiding principle of our ancient kings. . . Of late years, however, (the capital) has been overrun by a host of pharmacists and alchemists, such as Wei Shan-Fu, Liu Pi and others, recommending one another right and left with ever wilder and more extravagant claims. Now if there really were immortals, and scholars possessing the Tao, would they not conceal their names and hide themselves in mountain recesses far from the ken of man? Their only fear would be to come in contact with humankind. How is it then that we have all these characters hanging about the vestibules of the rich and the great, and boasting of their wonderful pharmaceutical arts—surely they cannot be men who possess the Tao. They have come for nothing but profit. By saying that they can transform themselves into spirits they tempt the powerful and those in high positions, and for a while their astounding claims convince. But when their lies are found out, they think it no shame to decamp without ceremony. This is the plain truth. How can you credit their words and consume their elixirs? . . .

The medicines of the sages of old were meant to cure bodily illnesses, and were not meant to be taken constantly like food. How much less so these metallic and mineral substances which are full of burning poison! . . .

Of old, as the *Li Chi* says, when the prince took physic, his minister tasted it first, and when a parent was sick, his son did likewise. Ministers and sons are in the same position. I humbly pray that all those persons who have elixirs made from transformed metals and minerals, and also those who recommend them, may be compelled to consume (their own elixirs) first for the space of one year. Such an investigation will distinguish truth from falsehood, and automatically clarify the matter by experiment (*khao chhi chen wei, tsê tzu jan ming yen*).

The petition was not accepted and Phei Lin demoted to be Chiang-ling Ling, a provincial official at Chiang-ling.

The same biography of Phei Lin concludes with details about Chang Kao, a scholar who made a similar memorial to Mu Tsung<sup>2</sup> c. + 823. After Mu Tsung came to the throne Liu Pi and others were executed but then he himself gradually came under the influence of the alchemists. Chang Kao wrote:

If mental calm is maintained, the blood and the *chhi* (*pneuma*) will be harmonised. If lust and desire gain the upper hand illness will follow. Medicines are for use against illnesses, and should not be taken as food. Formerly Sun Ssu-Mo said that the actions of medicines give assistance by their specificity, but they disquiet the *chhi* of the viscera. Even when one is ill medicines must be used with great circumspection; how much more so when one is not ill. If this is

<sup>1</sup> *Chiu Thang Shu*, ch. 171, p. 6b. See also Giles (1923), p. 152.

<sup>2</sup> Reigned +820 to +824; personal name Li Hêng.

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true for the common people how much more so will it be for the emperor! Your imperial predecessor believed the nonsense of the alchemists and thus became ill; this your majesty already knows only too well. How could your majesty still repeat the same mistake?<sup>1</sup>

The emperor appreciated his words. But soon afterwards he fell ill and died.

The next Thang emperor who fell victim to elixirs was Wu Tsung.<sup>2</sup> The *Chiu Thang Shu* says:<sup>3</sup>

The emperor (Wu Tsung) favoured alchemists, took some of their elixirs, cultivated the arts of longevity and personally accepted (Taoist) talismans. The medicines made him very irritable, losing all normal self-control in joy or anger; finally when his illness took a turn for the worse he could not speak for ten days at a time. The prime minister Li Tê-Yü and others asked for audience but were refused, and nobody inside or outside the palace knew his real state, so that people were alarmed and sensed danger. On the 23rd day of that month (22nd April, +846) the imperial will was read, and the emperor's uncle, Prince Kuang (Li Shen), ascended the throne (as Hsüan Tsung) in front of the coffin.

After this it will hardly be believed that Li Shen himself was interested in elixirs towards the end of his reign. According to Giles (1898)<sup>4</sup> he died of them, but this is not mentioned in the dynastic history;<sup>5</sup> indeed on the contrary the Taoist hermit and alchemist Hsienyuan Chi of Lo-fou Shan declined to venture elixirs in the cure of the emperor's illness in +858 and restricted himself to moralising speeches. Other sources however support the view of Giles, for instance the *Tung Kuan Tsou Chi* (Record of Memorials from the Eastern Library) written about +890 by Phei Thing-Yü, who names other alchemists less scrupulous. He says:<sup>6</sup>

A medical official, Li Hsüan-Po, presented to the emperor cinnabar which had been heated and subdued by fire, in order to gain favour from him. Thus the ulcerous disease of the emperor (Hsüan Tsung) was all attributable to his crime. When I Tsung came to the throne (in +860) (Li) Hsüan-Po, the hermit Wang Yo and the Taoist Yü Tzu-Chih were all executed in the market-place.

There is plenty of evidence that the taking of metallic elixirs was not confined to the imperial court, but extended over wide circles of society and might affect anyone who could afford to pay. Thus a famous writer Yeh Mêng-Tê gave in +1156 an account of friends personally known to him who had suffered the

<sup>1</sup> Abridging *Chiu Thang Shu*, ch. 171, p. 8a. The *Pien Huo Pien* (ch. 4, p. 7b) has an abridged parallel passage.

<sup>2</sup> Reigned +840 to +846; personal name Li Yen. He was strongly opposed to Buddhism; cf. an edict of his tr. Giles (1923), pp. 153 ff.

<sup>3</sup> Ch. 18A, p. 17b.

<sup>5</sup> *Chiu Thang Shu*, ch. 18B.

<sup>4</sup> No. 119.

<sup>6</sup> Ch. 3, p. 7a.

consequences of what had by then become a veritable superstition. In his *Pi Shu Lu Hua* he mentions that<sup>1</sup>

in not a few cases ordinary people and scholars in official positions have died from eating cinnabar. With my own eyes I saw what happened to Lin Yen-Chen who was normally very robust and could eat and drink more than a normal person. He lived at Wu and often boasted about his health and muscular strength. But a physician, Chou Kung-Fu, claimed to have obtained a secret formula from Sung Tao-Fang for the preparation of a cinnabar elixir which could prolong life and was at the same time harmless. (Now) (Sung) Tao-Fang had been a good doctor in Hungchow so (Lin) Yen-Chen believed this and took the elixir for three years. Whereupon ulcers developed in his chest, first near the hairs as large as rice-grains, then after a couple of days his neck swelled up so that chin and chest seemed continuous. After ten months he died. When he was very bad his doctors caused the pus and blood to be wiped away with a cloth, and after standing in water cinnabar powder was found at the bottom. Thus it had accumulated in the body and came out with the poison. There was also Hsieh Jen-Po. Whenever he heard of anyone who had some cinnabar subdued by fire he went after it, caring nothing about the distance, and his only fear was that he would not have enough. Last year he also developed ulcers in the chest. At the onset of his illness his friends noticed a change in his appearance and behaviour, but still he did not recognise the influence of the poison, till suddenly it came upon him like a storm of wind and rain, and he died in a single night.

Thus in the past ten years I have personally seen these two cases, which ought to be a warning to others.

We also read about those who were more cautious in such matters. For example, the emperor Liang Wu Ti<sup>2</sup> declined to take the elixirs offered by the alchemist Têng Yü-Chih,<sup>3</sup> but did not hesitate to try those prepared for him by his friend Thao Hung-Ching, because he had confidence in the work of that great herbal pharmacist.<sup>4</sup> The emperor Wên Hsüan<sup>5</sup> of the Northern Chhi, on the other hand, was only prepared to try the life-giving drug at an opportune moment—on his deathbed. The *Pei Shih* (History of the Northern Dynasties) says:<sup>6</sup>

He ordered Chang Yuan-Yu and other alchemists to make the *chiu chuan chin tan* (ninefold cyclically transformed elixir). When it was accomplished the emperor kept it in a box made of jade and said, 'I am still too fond of the pleasures of the world to take flight to the heavens immediately—I intend to consume the elixir only when I am about to die.'

Of scholars we read about the great poet and civil servant Su Tung-Pho (+ 1036 to + 1101) who was acquainted with the art of alchemy, but nevertheless showed

<sup>1</sup> Ch. 1, p. 76 *b*. The same passage was quoted some 30 years later by another Chang Kao in his *I Shuo* (ch. 9, p. 15 *a, b*) which contains quite an anthology of warning pieces about the taking of elixirs and also a story about Sung Tao-Fang (ch. 9, p. 23 *a, b*).

<sup>2</sup> Reigned + 502 to + 549; personal name Hsiao Yen.

<sup>3</sup> Cf. *Nan Shih*, ch. 76, p. 8 *b*.

<sup>5</sup> Reigned + 550 to + 559; personal name Kao Yang.

<sup>4</sup> *Ibid.* p. 9 *a*.

<sup>6</sup> Ch. 88, p. 12 *a*.

great discretion when he was offered an elixir. In a letter to a friend, Wang Ting-Kuo, he wrote, 'I have recently received some cinnabar (elixir) which shows a most remarkable colour, but I cannot summon up enough courage to try it. . . .'<sup>1</sup>

To what extent did caution generate procedures which we could call clinical experiment and test? As we have seen, alchemy found great favour with many emperors. Besides those already mentioned we may single out Tao Wu Ti<sup>2</sup> of the Northern Wei, and Hsüan Tsung<sup>3</sup> of the Thang. The events at the beginning of the + 5th century were particularly interesting. Thopa Kuei instituted a professorship of Taoism and alchemy with facilities for the study and preparation of elixirs. According to the *Wei Shu* (History of the Northern Wei Dynasty),<sup>4</sup>

In the 3rd year of the Thien-Hsing reign-period (+ 400) (the emperor Tao Wu Ti) instituted a Hsien Jen Po Shih Kuan (Office of the Alchemist-Royal) to take charge of the preparation of drugs and elixirs (*chu lien pai yao*).

Elsewhere it says:<sup>5</sup>

(The emperor) was fond of the teachings of Lao Tzu. . . . During the Thien-Hsing reign-period he appointed an Alchemist-Royal and built an imperial elaboratory (*hsien fang*) for the concocting of drugs and elixirs. He also reserved the Western mountains (Hsi-shan) for the supply of fire-wood (for the furnaces). Furthermore, he ordered criminals who had been sentenced to death to test (*shih fu*) (the products) against their will. Many of them died and (the experiments gave) no decisive result (*wu yen*).

This raises the whole question of systematic biological experimentation on man and animals, the history of which has been sketched by Green (1954) and Bull (1951). That is something distinct from biological observation and dissection, on which of course there are famous Hellenistic traditions concerning Herophilus and Erasistratus<sup>6</sup> and Cleopatra.<sup>7</sup> Thopa Kuei's + 5th-century use of condemned criminals for what were in principle clinical therapeutic trials was followed many times in subsequent ages, as e.g. by the great surgeon Ambroise Paré in the + 16th century for testing the supposed beneficial effects of bezoar and unicorn's horn in corrosive sublimate poisoning, and by the physicians of Queen Caroline in + 18th-century London when they inoculated some of the Newgate prisoners. The first real clinical trial with carefully matched controls seems to have been that of James Lind who in + 1747 investigated the powers of various citrus fruits

<sup>1</sup> See *Lu Hsueh Chien Chieh Lu* (Precautions in the Work of the Stove) by Yü Yen, p. 9a.

<sup>2</sup> Reigned + 386 to + 408; personal name Thopa Kuei.

<sup>3</sup> Reigned + 712 to + 762; personal name Li Lung-Chi.

<sup>4</sup> Ch. 113, p. 3a.

<sup>5</sup> Ch. 114, pp. 32b, 33a.

<sup>6</sup> Discussed by Dobson (1925, 1927).

<sup>7</sup> Cf. Needham (1959), p. 65.

as preventives against scurvy. But Avicenna's *Canon Medicinæ* (*Qānūn-fī al-Ṭibb*) of about +1030 is said to give rules for the testing of drugs in paired cases of uncomplicated disease.

Pharmaceutical experiments on animals must also go back very far in China as in other civilisations. The fowl was traditional as a test-animal in forensic medicine, as we know from the +13th-century *Hsi Yuan Lu* (Washing Away of Wrongs);<sup>1</sup> and this theme was common in later Chinese opera, which appreciated the skill of popular magistrates in the detection of crime. But the most famous example is that of the alchemist Wei Po-Yang and his pupil Yü Sêng in the +2nd century. It will be remembered that Wei Po-Yang was the author of the celebrated treatise *Tshan Thung Chhi* (The Kinship of the Three), which is regarded as the oldest complete alchemical book extant in any culture. It is said that<sup>2</sup>

Wei Po-Yang entered the mountains to prepare the magical elixir. With him were three disciples, two of whom were lacking in complete faith. When the elixir was made he warned them saying, 'Although the gold elixir is now accomplished we ought first to test it by feeding it to a white dog. If the dog can fly after taking it then it is edible for man; if the dog dies then it is not.'

The story continues paradoxically; the dog dies but Wei and his disciple Yü take the medicine all the same and fall down dead, after which the two cautious disciples depart from the mountains. After they have gone Wei and Yü revive, rejoice in their faith, take more of the elixir and go the way of the immortals. The substance was probably considered to be an amalgam of mercury with gold or lead. Although the story is not in the original *Lieh Hsien Chuan*, some of which goes back to the -1st century, its presence in the *Yün Chi Chhi Chhien* secures it a date prior to the +11th. Besides its interest for the pre-history of animal experimentation, it must also have allegorical significance in connection with the death-and-resurrection philosophy of classical Taoism.<sup>3</sup>

Notices of the poisonous effects of elixirs occur from an early time in Chinese literature. We have seen the cautious attitude adopted by the emperors Wu of the Liang and Wên Hsüan of the Northern Chhi when they received elixirs from the alchemists. This was the orthodox position of the pharmaceutical naturalists, whose series of *Pên Tshao* compendia form so prominent a feature of Chinese

<sup>1</sup> Ch. 3, p. 34 b. See also Giles (1898).

<sup>2</sup> *Yün Chi Chhi Chhien*, ch. 109, pp. 5 a ff.; also Wu & Davis (1932).

<sup>3</sup> Cf. *SCC*, vol. 2, pp. 139 ff.

medieval chemical and biological literature. Thus Khou Tsung-Shih (fl. + 1110 to + 1119), the author of the *Pên Tshao Yen I* (The Meaning of the Pharmacopoeia Elucidated), pointed out very plainly the poisonous nature of mercury [cf. Figs. 91 (pl.), 92]. He says:<sup>1</sup>

Although there are medical recipes that include mercury, great care should be exercised because of its toxic effects. For a woman an overdose causes sterility. Nowadays people often use it for treating convulsion, fever, and increasing the flow of saliva (*ching jê hsien chhao*) in children. Not a word about these uses can be found in the (*Shen Nung Pên Tshao*) *Ching*.<sup>2</sup> Hence the matter requires further elucidation. (Mercury when) mixed with lead forms an amalgam (*ning*; lit. coagulates). It has an affinity for (*chieh*; lit. ties with) sulphur (forming mercuric sulphide). It breaks up (*san*; lit. disperses) when ground together with the fleshy part of a date. In one of its applications it can be heated to form face-powder (*ni fên*).<sup>3</sup> Calomel (*fên shuang*) ground with saliva can be used for killing fleas. Copper brightens when (mercury) is applied to it. If poured into a corpse mercury will delay putrefaction. Gold, silver, copper and iron will float when placed on mercury. With lead (*tzu ho chhê*) mercury is subdued (*fu*).

Han Yü of the Thang (period) said:<sup>4</sup> 'Li Chhien,<sup>5</sup> a Professor of the Imperial Academy (Thai Hsüeh Po Shih), met the alchemist Liu Pi,<sup>6</sup> a man from Hsin-an, who could heat mercury and convert it into an elixir. The method consisted of filling a reaction-vessel (*ting*)<sup>7</sup> with lead, leaving some space at the centre for the introduction of mercury, and when the cover was replaced and sealed all round, the contents was heated to form cinnabar.<sup>8</sup> After taking (the elixir) (Li Chhien) passed blood in urine and faeces, and after four years he got worse and died. I do not know exactly when the teaching about elixirs first began. (Although) it has resulted in countless deaths among the people, yet the art is still admired and sought after even today. (Many instances of) such delusion have already been recorded in the literature. Without quoting from hearsay evidence I shall now refer to six or seven persons known to me personally who came to grief after taking elixirs. I witnessed these things myself and set them forth here to serve as a public warning.

Kuei Têng, once Minister of Works (Kung Pu Shang Shu),<sup>9</sup> told me that he fell ill after taking mercury. He felt as if he was being pierced by a red-hot iron rod, from head to toe, so much so that it seemed that flames were coming out of his orifices and joints. He screamed aloud with the pain, and mercury was found in his mattress. After vomiting blood for over ten years he

<sup>1</sup> *Pên Tshao Yen I*, ch. 5, pp. 2 a ff.; also in *Pên Tshao Kang Mu*, ch. 9, pp. 12 a ff.

<sup>2</sup> The first of the pharmacopoeias, written c. — 1st century.

<sup>3</sup> It has a high content of calomel; cf. Read & Pak (1936), no. 45.

<sup>4</sup> In *Han Chhang-Li Wên Chi* (Collected Literary Works of Han Yü), ch. 34, pp. 11 b ff., and quoted in abridged form by Chang Kao in *I Shuo*, ch. 9, pp. 18 a ff. From here to the end a parallel passage, almost a quotation, is given in the *Pien Huo Pien* (ch. 4, pp. 6 b ff.) written by Hsieh Ying-Fang in + 1348.

<sup>5</sup> Also known as Li Yü, but corrupted as Li Kan in the *I Shuo*, the *Pien Huo Pien* and the *Pên Tshao Kang Mu*. He died in + 823.

<sup>6</sup> He prepared elixirs for Hsien Tsung. See p. 317 above and also *Chiu Thang Shu*, ch. 16, p. 1 b.

<sup>7</sup> See Ho & Needham (1959 a).

<sup>8</sup> This should either be a lead amalgam, or else sulphur was included but not mentioned.

<sup>9</sup> See for example Kracke (1957).





Fig. 92. Retort still for mercury, from the *Thien Kung Khai Wu* of +1637 (Chhing drawing).

died. Li Hsü-Chung, a Palace Censor (Tien Chung Yü Shih), died (from mercury poisoning) with boils on his back. Li Sun, once Minister of Justice (Hsing Pu Shang Shu),<sup>1</sup> informed me that he had made a blunder by taking the elixir, and he died subsequently. Li Chien, an Executive Official of the Board of Punishments (Hsing Pu Shih Lang), died instantly (from elixir poisoning) while in excellent health. Mêng Chien, another Minister of Works (Kung Pu Shang Shu), invited me to see him at Mêng-chou and said to me in private, "I have acquired this secret drug, and as I do not wish to become an immortal all by myself, I am offering you some in a container. It should be made into pills with the fleshy part of the jujube date and eaten." One year after we parted from each other he was taken ill. Later someone went to enquire after him and found him saying, "What I ate before was the wrong drug, but I shall recover after getting rid of it (by taking an antidote)." But he died after an illness of two years. Again, (after taking an elixir) Lu Than, the Regional Commandant (Chieh Tu) of Tung-chhuan and Censor-in-Chief (Yü Shih Ta Fu), passed blood and suffered such unbearable pain in his body that he begged to have his life taken away. Li Tao-Ku, Commander of the Imperial Guard (Chin-Wu Chiang-Chün), punished the guilty Liu Pi by obliging him to take the drug himself;<sup>2</sup> so that he died at sea at the age of 50.

These (examples) should (be sufficient) to serve as warnings. Is it wise to try to avoid death in such a way as to hasten one's death instead? The five cereals, the three kinds of animals used for offerings (*san shêng*, i.e. fowls, fish and pigs), salt, vinegar, fruits and vegetables are the things that men normally eat; they constitute the essential foods which give us strength. Now misguided people clamour that the five cereals shorten human life and should be eaten as little as possible. They only feel sorry for themselves when death is approaching. How regrettable this is!<sup>3</sup>

Nowadays there are people who roast mercury into cinnabar, but without being aware of (the poison) some physicians use (the cinnabar) for coating medicines or as ingredients of prescriptions. Is not this a great mistake and can we ever be off our guard?

Perhaps the strongest and most open condemnation of the use of poisonous substances by the alchemists came later from Li Shih-Chen (+ 1518 to + 1593), the great pharmaceutical naturalist and physician who composed the *Pên Tshao Kang Mu* (Great Pharmacopoeia). It may suffice to quote just a few of the many remarks he made in his celebrated work. About the use of gold as an elixir ingredient he says:<sup>4</sup>

... Gold was rarely mentioned in ancient medical recipes, but has been the talk of the alchemists. In the *San-shih-liu Shui Fa* (Thirty-Six Methods for Bringing Solids into Aqueous Solu-

<sup>1</sup> It is strange that Li Hsü-Chung is supposed to have written one of the most important books on the divination of individual fates (see further *SCC*, vol. 2, p. 358).

<sup>2</sup> The *Chiu Thang Shu* (ch. 16, p. 1 b) says that Li Tao-Ku and Huangfu Tsun had recommended him to the emperor. Cf. pp. 317, 318, 323.

<sup>3</sup> But the *Thiao Chih Yü Yin Tshung Hua* by Hu Tzu of the Sung period says that Han Yü himself took sulphur at the end of his life and died. Here ends the quotation from Han.

<sup>4</sup> Ch. 8, pp. 6b ff.

tions)<sup>1</sup> of Huai-nan (Wang) it is converted into a liquid potion. In Ko Hung's *Pao Phu Tzu* the ingestion of (solid) gold is stated to be as effective as (the drinking of) potable gold.<sup>2</sup> According to this method when (gold) is treated one hundred times with the skin and lard of pigs, and with vinegar, it will soften. Alternatively it can be mixed with the bark of the 'stinking cedar' (*shu* or *chhu*)<sup>3</sup> or solubilised with wine made from the *mu ching* shrub (*Vitex negundo*)<sup>4</sup> and magnetite, or ingested with realgar and orpiment. The state of terrestrial immortal (*ti hsien*) can thus be attained. It is also said that cinnabar can be made into 'gold of the sages' (*shêng chin*), which brings about immortality when eaten. The (*Ming I*) *Pieh Lu* (Informal Records of Famous Physicians) (by Thao Hung-Ching) and (the *Pên Tshao Shih I* of) Chhen Tshang-Chhi also mention that taking (gold) over a long period will bring about the state of immortality. Such sayings must have been handed down by the alchemists since the time of Chhin (Shih) Huang (Ti) (reigned - 221 to - 210) and Han Wu (Ti) (reigned - 140 to - 87). However, (the alchemists) will never realise that the human body, which thrives on water and the cereals, is unable to sustain such heavy substances as gold and other minerals within the stomach and intestines for any length of time. How blind it is, in the pursuit of longevity, to lose one's life instead! . . .

Earlier he mentions<sup>5</sup> that the Empress Chia of Hui Ti of the Chin Dynasty was assassinated in + 300 by being forced to drink a wine containing gold fragments (*chin hsiao chiu*).<sup>6</sup>

Li Shih-Chen criticised not only the alchemists but also some of the pharmacopoeias for the use of poisonous substances. In another place he says:<sup>7</sup>

. . . The *Ta Ming* (*Jih Hua Pên Tshao*) (The Pharmacopoeia of Ta Ming, Jih Hua Tzu)<sup>8</sup> alleges that (mercury) is not poisonous; the (*Shen Nung*) *Pên (Tshao) Ching* states that eating (it) over a long period will make a man immortal; Chen Chhüan maintains<sup>9</sup> that (mercury) is the 'mother' (i.e. the basic ingredient) of the 'cyclically-transformed' elixir (*huan tan*); and Pao Phu Tzu (i.e. Ko Hung) regards (it) as a prime medicine of longevity. I am not able to tell the number of people who since the Six Dynasties period (+ 3rd to + 6th centuries) so coveted life that they took (mercury), but all that happened was that they impaired their health permanently or lost their lives. I need not bother to mention the alchemists, but I cannot bear to see these false statements made in pharmacopoeias. However, while mercury is not to be taken orally, its use as a medicine must not be ignored.

Already in the Sung a prophetic passage had been written by Shen Kua in his *Mêng Chhi Pi Than* (+ 1086) in which he had given expression to the view that

<sup>1</sup> See Tshao, Ho & Needham (1960).

<sup>2</sup> *Nei Phien*, ch. 4, pp. 18 a, 20 b, 21 a and ch. 11, p. 19 a. See also Feifel (1944, 1946).

<sup>3</sup> See Tshao, Ho & Needham (1960).

<sup>4</sup> A medicinal plant; see Read (1936), no. 148.

<sup>5</sup> *Pên Tshao Kang Mu*, ch. 8, p. 6 a.

<sup>6</sup> See *Chin Shu*, ch. 31, p. 11 b.

<sup>7</sup> *Pên Tshao Kang Mu*, ch. 9, pp. 12 b, 13 a.

<sup>8</sup> A pharmacopoeia composed c. +972 by Jih Hua Tzu, whose name was probably Ta Ming according to Li Shih-Chen.

<sup>9</sup> Author of the early +7th-century pharmacopoeia *Yao Hsing Pên Tshao*.

mercury compounds were valuable in certain ways and might become even more so if we only knew more about them. He says:<sup>1</sup>

My cousin Li Shan-Shêng and several friends of the same generation once transformed cinnabar into an elixir. More than a year afterwards the product was again put into a reaction-vessel to be purified, but then by mistake one piece was left behind. One of his students made it into a pill and ate it, after which he became delirious and died after one night. Now cinnabar is an extremely good drug and can be taken even by a newborn baby, but once it has been changed by heat it can kill an (adult) person. If we consider the change and transformation of opposites into one another, since (cinnabar) can be changed into a deadly poison why should it not also be changed into something of extreme benefit? Since it can change into something which kills, there is good reason to believe that it may have the pattern-principle (*li*) of saving life; it is simply that we have not yet found out the art (of doing this). Thus we cannot deny the possibility of the existence of methods for transforming people into feathered immortals, but we have to be very careful about what we do.

These words are quite remarkable when one considers the great use of organo-metallic compounds in modern medicine, e.g. mercury in salvarsan or antimony for kala-azar. One is also reminded of the profound conviction of Paracelsus centuries later that 'poisonous action and remedial virtue are intimately bound up with each other', as in the case of arsenic and especially mercury.<sup>2</sup> So also Paracelsus said: 'Die Dosis macht dass ein Ding kein Gift sei.'<sup>3</sup> Today it is fully recognised that a powerful remedy is almost of necessity also in certain circumstances a powerful poison.<sup>4</sup>

All the descriptions which we have of the symptoms exhibited by those suffering from elixir poisoning agree broadly with classical descriptions of intoxication with mercury, lead and arsenic. In mercury poisoning there is excessive salivation and ulceration of the gums, fever and bloody vomiting or purgation, together with severe 'hot' pains. Muscles may be affected by tremor or paralysis and there may be severe impairment of the special senses. The effects on the mind are very marked, leading through abnormal irritability to idiotic, melancholic or manic conditions. It will be remembered that of some of the elixir-taking emperors it was said *pu shih wan chi*—'he no longer knew what was going on around him'. The fact that mercury is excreted in the sweat and urine would account for the statement in another description that the metal was recovered from the mat on which the patient had lain.

<sup>1</sup> *Mêng Chhi Pi Than*, ch. 24, p. 7b. The story was told again by Khou Tsung-Shih in his *Pên Tshao Yen I* (+ 1116), ch. 4, p. 2a.

<sup>2</sup> Pagel (1958), p. 145.

<sup>3</sup> Lieben (1935), pp. 13 ff.

<sup>4</sup> Green (1954), p. 19.

Symptoms of chronic lead poisoning may also be detected in the descriptions of the effects of elixirs. Though no observation seems to have been made of the famous blue line on the gums, loss of appetite, headache, tearing pains, colic, cramps, paralysis and 'wrist-drop' all appear. As in the 'Poitiers colic' described by Citois in +1616, there are accounts of formication or needling pains all over the skin, and of loss of control of elbows, hands and leg joints. Colic, cramps, vomiting and purgation occur also in arsenic poisoning. The increased appetite in the early stages of the process may have been something of a trap for the alchemists.

It would be well worth while to follow up in the medical literature discussion of poisoning by metals and minerals; here we shall only remark that Sung Tzhu in his *Hsi Yuan Lu* (The Washing Away of Wrongs)<sup>1</sup> (+1247) was well acquainted with their effects in the context of forensic medicine. Thus he gives as a test for mercury poisoning the formation of a superficial amalgam on a piece of gold plunged into the intestine or tissues.<sup>2</sup> He also describes<sup>3</sup> the colic and cramps of arsenic poisoning, as well as the discharge of blood, and gives<sup>4</sup> several antidotes including emetics which may be used. He also treats<sup>5</sup> of calomel poisoning. Similar material is found in later works such as the *Wu Yuan Lu* (Cancelling of Wrongs) of Wang Yü (+1308).

Mercury compounds were of course habitually used in Chinese medicine,<sup>6</sup> but in general one gets the impression that the dosages prescribed by the physicians were much smaller than those used by the alchemists. For example, Sun Ssu-Mo's chief medical work, the *Chhien Chin I Fang* (Supplement to the Thousand Golden Remedies), about +665, gives a series of medicaments containing 1 part of cinna-

<sup>1</sup> This has been translated by Giles (1924).

<sup>2</sup> Ch. 3, p. 39a. That this goes back to the Han or at least the Chin is shown by a statement in the *Chin Kuei Yao Lieh* (ch. 25, p. 99) by Chang Chung-Ching of the +2nd century, edited by Wang Shu-Ho of the +3rd.

<sup>3</sup> Ch. 3, p. 38a.

<sup>4</sup> Ch. 4, p. 15a.

<sup>5</sup> Ch. 4, p. 17a, b.

<sup>6</sup> It is worth noting that in the history of Chinese medicine there is nothing corresponding to the European +17th-century quarrel between the Galenists and the Chymists. The Chinese had never confined their pharmacopoeia to plant drugs—mineral and animal material had always been admitted. In using mineral substances the medieval Chinese physicians were seeking, like their colleagues in medieval and Renaissance Europe, for emetics, cathartics, diuretics, diaphoretics, tonics, anodynes, and drugs promoting suppuration. The armamentarium attained by the European chymists of the early +17th century, as shown by Croll's *Basilica Chemica*, has been analysed by Multhauf (1954), and would be well worth comparing with the pharmacopoeias of Sung and Yuan. One interesting point is that antimony preparations are almost absent from medieval Chinese medical chemistry, though in that of the Renaissance as prominent as mercury and arsenic, and this is particularly strange, for China has in Southern Hunan and Kuangsi the largest deposits of antimony in the world. We suspect that there were local uses which did not get into the pharmacopoeias, as in the outstanding case of *Rauwolfia*.

bar in from 14 to 40 parts of other mineral and plant drugs ( $2\frac{1}{2}$ -7 per cent).<sup>1</sup> Yet in the beginning of the book, in his entry for cinnabar among the minerals, he repeats the time-honoured doctrines that it is not poisonous, and can transform people into immortals. And in the alchemical literature formulae are attributed to him containing only minerals and including from 35 to 90 per cent of cinnabar and calomel. This we may see for instance in the *Thai-Chhing Chen-Jen Ta Tan* (The Great Elixirs of the Adept; a Thai-Chhing Scripture).<sup>2</sup> Unfortunately the dosages of the alchemists are very seldom given, and the recipes just mentioned use 'the lard of an old sow' as the vehicle of administration so that one can hardly tell how much the aspirants to immortality took. As time went on the physicians' dosages seem to have become more and more conservative, for in the *Wai Thai Pi Yao* (Important Medical Family Practice of a Frontier Official) of Wang Thao (+ 752) one finds prescriptions in which cinnabar occurs to the extent of only 1 part in 356 of other mineral and plant material (about 0.28 per cent).<sup>3</sup> These formulae are described among the general tonics or panaceas.

Perhaps the medieval Chinese alchemists should not be too strongly condemned for their heroic medication with mercury. After its introduction as a cure for venereal diseases in + 16th-century Europe it was applied indiscriminately and excessively down to the end of the + 19th century, for malaria, dysentery and other febrile conditions, even to the extent of doses as lethal as those of the Taoists. For syphilis indeed mercury justly remained down to the time of introduction of salvarsan (1910) the principal, and almost the only, treatment.<sup>4</sup>

Actually many a Chinese alchemist must himself have perished as the result of his experiments. It is, however, difficult to find such instances recorded in Taoist writings, since they would have militated against the characteristic doctrine that physical death was avoidable. We can only infer such instances from certain descriptions of *shih chieh* ('release from the mortal part'),<sup>5</sup> *yü hua* ('taking flight to attain the state of immortality'), *kao hua* ('announcing the change to the state of immortality'), etc.,<sup>6</sup> although we can seldom tell whether these were the direct

<sup>1</sup> Ch. 20, p. 232.2.

<sup>2</sup> Reproduced in *Yün Chi Chhi Chhien*, ch. 71, pp. 1 a ff. (esp. 2 b and 3 b).

<sup>3</sup> Ch. 31, p. 849.

<sup>4</sup> Calomel too was so greatly valued for its diuretic properties in the treatment of dropsy that over-prescription led to abandonment, and its reintroduction by Jendrassik in the late 19th century has been described by Sollmann as amounting virtually to a re-discovery.

<sup>5</sup> See SCC, vol. 2, p. 141.

<sup>6</sup> No less than 19 such terms are listed in the *Li Shih Chen Hsien Thi Tao Thung Chien* (Comprehensive Mirror of the Adept; who attained the Tao throughout History), no. 293 in Wieger (1911), a vast tractate probably of the Yuan dynasty, by Chao Tao-I.

consequences of elixir poisoning. In the *Yün Chi Chhi Chhien* (The Seven Tablets of the Cloudy Satchel), a great compendium compiled c. +1022 by Chang Chün-Fang, it is mentioned<sup>1</sup> that no visible sign of putrefaction was noticed in the body of Sun Ssu-Mo more than a month after his death. Possibly this great +7th-century alchemist and pharmacist had taken one of the many elixirs containing mercury or arsenic described in his own work *Thai-Chhing Chen-Jen Ta Tan* already mentioned. His secret recipe for the making of the gold elixir (*chin tan*), for example, consists of 8 oz of gold, 8 oz of mercury, 1 lb of realgar (arsenic disulphide) and 1 lb of orpiment (arsenic trisulphide).<sup>2</sup>

The alchemists themselves were quite aware of the phenomena of elixir poisoning. Accounts of about thirty-five common mistakes made in the preparation of elixirs are mentioned in the *Chen Yuan Miao Tao Yao Lüeh* (Classified Essentials of the Mysterious Tao of the True Origin of Things)<sup>3</sup> a text probably of the +8th or +9th century, but parts of which may go back to the +4th century, the time of its putative author Chêng Ssu-Yuan. Among the warnings against mistakes we find three clear types of elixir poisoning. The author records cases where people died from eating elixirs made from cinnabar, mercury, lead and silver; cases where people suffered from boils on the head and sores on the back by ingesting cinnabar obtained from roasting together mercury and sulphur; and cases where people became seriously ill through drinking 'liquid lead' made by heating 'black lead'. The Thang alchemist Chhen Shao-Wei asserts in his work *Ta-Tung Lien Chen Pao Ching, Chiu Huan Chin Tan Miao Chüeh* (Mysterious Teachings on the Ninefold Cyclically-transformed Gold Elixir according to the Precious Manual of the Re-casting of the Primary (Vitalities); a Ta-Tung Scripture)<sup>4</sup> that the metals iron, copper, silver, lead, tin and gold are all poisonous.

According to the attitude which they adopted towards elixir poisoning the Chinese alchemists may be divided, broadly speaking, into two different schools. The first ignored the poison danger altogether and considered the symptoms supervening after taking elixirs to be quite normal and even essential. The second recognised the poisonous nature of some of the constituents and tried to neutralise it in one way or another, or else to use only substances which were harmless.

The *Thai-Chhing Shih Pi Chi* (Records in the Rock Chamber: a Thai-Chhing

<sup>1</sup> Ch. 113, p. 204.

<sup>2</sup> *Yün Chi Chhi Chhien*, ch. 71, p. 9b.

<sup>3</sup> No. 917 in Wieger (1911). This is the book which contains the oldest formula in any civilisation for a proto-gunpowder; it included arsenic besides saltpetre and sulphur, with dried honey as the source of carbon. See further SCC, vol. 5. Cf. p. 80 above.

<sup>4</sup> No. 884 in Wieger (1911).

## ELIXIR POISONING

Scripture),<sup>1</sup> a text written probably in the +6th century, but containing materials of the +3rd, describes after-effects which it regards as quite normal, and recommends methods of bringing relief when they occur. It says:<sup>2</sup>

After taking the elixir one feels an itch all over the body and the face, rather like having the sensation of insects crawling over one. The body, the face, the hands and the legs may become swollen. One may experience a feeling of repulsion at the sight of food, and vomiting usually follows after a meal. One feels rather weak in the four limbs. Other symptoms include frequent defaecation, vomiting, headache and pains in the abdomen. No alarm should be caused by these effects, because they are due to the work of the elixir in dispelling all the inherent disorders (in the human body).

To help the working of the elixir the book recommends that after eating it one should avoid tasting mutton or carp or any (cooked) blood, or inhaling anything with a 'false' odour. The treatment it suggests for relieving the symptoms is as follows:

When the elixir takes effect one should immediately bathe oneself with hot and cold water and take a mixture of scallion, soya-bean sauce and wine. The same cure is to be recommended (for relieving the after-effects of) *hsün huang* (a dark variety of realgar).<sup>3</sup> If relief does not come, then a hornets' nest (*lu fêng fang*),<sup>4</sup> some *Euphorbia sieboldiana* (*kan sui*),<sup>5</sup> some Solomon's Seal (*Polygonatum officinale*) (*wei jui*)<sup>6</sup> and some *Ephedra sinica* (*ma huang*)<sup>7</sup> may be separately extracted with boiling water and combined for use as a medicine. One dose is sufficient to bring relief.

The second school is typified by Chang Yin-Chü, an alchemist of the +8th century, who in his book *Chang Chen-Jen Chin Shih Ling Sha Lun* (A Discourse on Metals, Minerals and Cinnabar, by the Adept Chang)<sup>8</sup> emphasised the poisonous nature of gold, silver, lead, mercury and especially arsenious acid, and said that he had witnessed many cases of premature death brought about by consuming cinnabar. He believed however that the poison could be rendered harmless by a proper choice and combination of ingredients; for example gold should be used together with mercury, while silver can only be used when combined with gold, copper carbonate and realgar for the preparation of the gold elixir (*chin tan*). Wu Wu, a +12th-century alchemist and author of the famous text on laboratory procedures, the *Tan Fang Hsü Chih* (Chemical Elaboratory Practice),<sup>9</sup> says in

<sup>1</sup> No. 874 in Wiegier (1911). [A draft translation of this book has been made by Ho Ping-Yü.]

<sup>2</sup> Ch. 2, p. 74.

<sup>3</sup> See Read (1941), no. 6.

<sup>4</sup> *Ibid.* no. 340, and Read (1936), no. 688; used in Chinese medicine as a tonic and sedative.

<sup>5</sup> See Stuart (1911), no. 169.

<sup>6</sup> No. 880 in Wiegier (1911).

<sup>7</sup> An antipyretic containing the important alkaloid ephedrine; see Stuart (1911), no. 161.

<sup>8</sup> No. 880 in Wiegier (1911).

<sup>3</sup> See Read & Pak (1936), no. 494.

<sup>5</sup> See Stuart (1911), no. 169.

<sup>9</sup> No. 893 in Wiegier (1911); see Ho & Needham (1959a).



another work, the *Chih Kuei Chi* (Guide to the Way of Return),<sup>1</sup> that lead and mercury are the two essential elixir ingredients and that the 'four yellow substances' (sulphur, orpiment, realgar and arsenious acid)<sup>2</sup> and the 'eight minerals' (sulphur, realgar, orpiment, gold, silver, copper, iron and lead)<sup>3</sup> are poisonous. Wu also says:<sup>4</sup>

Moreover, alum is potent enough to kill a tiger and sal ammoniac contains sufficient poison to make copper deteriorate. If such ingredients are added to mercury and then taken into the human stomach ten thousand deaths will follow in every ten thousand instances.

The *Tan Lun Chüeh Chih Hsin Chien* (Handbook of the Secret Teaching concerning Elixirs),<sup>5</sup> a text of uncertain date, but written by Chang Yuan-Tê not later than + 1020,<sup>6</sup> had similarly pointed out earlier that the 'four yellow substances' and the 'eight minerals' were poisonous, and advocated the use of only lead and mercury as elixir ingredients.

How poisons could be removed from elixir ingredients or rendered harmless was described in great detail in the large tractate *Huang Ti Chiu Ting Shen Tan Ching Chüeh* (Explanation of the Yellow Emperor's Manual of the Nine-Vessel Magical Elixir),<sup>7</sup> a text compiled during Tang or early Sung, but incorporating some material as old as the + 2nd century. It says:<sup>8</sup>

The five metals and the three *hung* (mercuries) together with the nine *chhien* (leads) and the eight minerals are all poisonous. Without procuring the original formulae of the ancient (masters) any attempt to use newly acquired recipes described verbally in a few words is doomed to failure. Hence Hu (Kang) Tzu<sup>9</sup> says, 'the five metals have to be purified from all poisons caused by heating. If they are not properly treated the poison will turn to a powder form, and if (the ingredients) are used for making elixirs without having their poison removed, and ingested for any length of time, death will be caused when the rules are not followed.'

Elsewhere this text says:<sup>10</sup>

The ancient masters (lit. sages) all attained longevity and preserved their lives (lit. bones) by consuming elixirs. But later disciples (lit. scholars) have suffered loss of life and decay of their bones as the result of taking them.

<sup>1</sup> Cf. p. 1 a; no. 914 in Wieger (1911).

<sup>2</sup> See Ho & Needham (1959b).

<sup>3</sup> *Ibid.*

<sup>4</sup> P. 4 a.

<sup>5</sup> No. 928 in Wieger (1911).

<sup>6</sup> Because quoted in the *Yün Chi Chhi Chhien* (ch. 66, p. 1 a), which gives the author's name as Chang Hsüan-Tê.

<sup>7</sup> No. 878 in Wieger (1911).

<sup>8</sup> Ch. 3, p. 6 b.

<sup>9</sup> Cf. SCC, vol. 4, pt. 1, p. 308, on magnetism and the geomantic compass.

<sup>10</sup> Ch. 10, p. 1 a.

The general method known to the ancients of rendering the ingredients harmless, according to this tractate,<sup>1</sup> was to treat them with wine made from the *mu ching* shrub (*Vitex negundo*)<sup>2</sup> or with saltpetre (*hsiao shih*) and vinegar. Another method of removing the poison from mercury was to ' (put it) in wine three years old, add sal ammoniac and boil it for 100 days'.<sup>3</sup> Yet another consisted of 'boiling (mercury) in vinegar containing fragments of gold and silver'.<sup>4</sup> The poison in realgar was to be removed by 'warming it in vinegar contained in a copper vessel over a gentle fire'<sup>5</sup> and that of lead by 'heating it in vinegar together with red salt and cinnabar'.<sup>6</sup>

The preceding school of thought can be understood better by reading the *Yin Chen-Chün Chin Shih Wu Hsiang Lei* (The Similarities and Categories of the Five (Substances) among Metals and Minerals, by the Adept Yin),<sup>7</sup> a text purporting to be of the +2nd century, which points out that elixir poisoning is due to the lack of understanding of alchemical theory. This, as we shall soon see, means precisely the theory of categories which we have elsewhere described.<sup>8</sup> Of sal ammoniac (*nao sha*) we read:<sup>9</sup>

If too much of it is used the (final) product will certainly cause death. It rapidly attacks the five viscera and also the five metals. These effects never fail. But if the finer principles are known the real use of sal ammoniac can be understood, indeed, the adepts use this substance to attain the great Tao.

Of saltpetre we read:<sup>10</sup> 'It is the essence of the Yin minerals... The adepts employ it to control (*chih*) the poison (of substances belonging to) the Greater

<sup>1</sup> Cf. ch. 8, p. 9b.

<sup>2</sup> No. 456 in Stuart (1911); used as astringent and sedative.

<sup>3</sup> Ch. 11, p. 5b.

<sup>4</sup> Ch. 11, p. 6b. If all these instructions meant that the aspirant should drink only such 'extracts' this may well have been a means of taking practically no mercury at all.

<sup>5</sup> Ch. 14, p. 3b.

<sup>6</sup> This +10th-century use of vinegar is interesting in connection with the preparation of acetates, sulphides and chlorides of metals by John of Rupescissa and Paracelsus in later Europe (cf. Multhauf (1954a), p. 365). So also the cathartic action of wine heated with mercury (*purgatio mercurii optimi*) will have been as well known to the physicians of the Sung as to the chymists of the European +17th century (cf. Multhauf (1954b), p. 112). Some of the Chinese instructions give one the impression that insoluble salts of the poisonous metals may sometimes have been obtained, in which case the ingestion of the filtrates or distillates would again have been fairly harmless. There is a close Paracelsian parallel here, for when from the +14th century onwards salts of metals were distilled to form 'healing quintessences', nothing came over except water and the volatile mineral acids, so that the preparations contained nothing of the metals (cf. Sherlock (1948), pp. 52, 56; Multhauf (1956), pp. 339 ff.; (1954b), p. 117; and Pagel (1958), p. 274).

<sup>7</sup> No. 899 in Wiegner (1911).

<sup>8</sup> See Ho & Needham (1959b).

<sup>9</sup> P. 20a.

<sup>10</sup> P. 20b.

Yang.' The same paragraph adds that 'sal ammoniac is the essence of the Yang minerals', which implies that it could be used to remove or to neutralise the poison of the Greater Yin, for example mercury. This is in effect the method for rendering mercury non-poisonous as described in the *Huang Ti Chiu Ting Shen Tan Ching Chiieh*.<sup>1</sup>

In other words, the ingredients selected had to be governed by the theory of categories. The importance of understanding the theory is emphasised in the following sentence:<sup>2</sup>

Sulphur (*liu huang*) is also employed in certain procedures for attaining a state of middle-grade immortality. (Substances) of similar categories (*hsiang lei*) must be used as its walls and chamber, (or to serve) as its officials and assistants, (or to supply it with) energy and strength. Those who know (these principles) will become middle-grade immortals (*chung hsien*)—those who use (sulphur) without understanding (them) will instantly turn into corpses.

The *Hsüan Chieh Lu* (Mysterious Antidotarium),<sup>3</sup> a work prefaced by an anonymous writer in +855, recognises the poison in the elixir ingredients, but recommends a potent herbal composition which would serve both as an elixir and as an antidote for ordinary elixir poisoning. The text takes the form of a dialogue between an adept named Chiu Hsiao Chün and one Liu Hung about the year +122. It deals with poisons in the ingredients and says that they cause death, or, in less severe cases, malignant boils. It then describes the preparation of such an antidote, *Shou Hsien Wu Tzu Wan* ('the five-herbs immortality-safeguarding pills') as follows:

Procedure for the making of the *Shou Hsien Wu Tzu Wan* pills: *yü kan tzu* (*Phyllanthus emblica* or Indian gooseberry),<sup>4</sup> *fu phen tzu* (*Rubus coreanus* or wild raspberry),<sup>5</sup> *thu ssu tzu* (dodder or *Cuscuta japonica*),<sup>6</sup> *wu wei tzu* (*Schizandra chinensis* and *Kadsura japonica*),<sup>7</sup> *chhê chhien tzu* (plantain or *Plantago major*).<sup>8</sup> Take 5 oz of each of the above 5 ingredients and pound them separately to a powder like flour. Take the young stems and leaves of the *kou chhi* (*Lycium chinense*),<sup>9</sup> during the second or the third months, pound them until 2 *shêng* (about 2 pints) of juice is obtained. Mix the juice with the powder and leave them to dry well. Take the *lien tzu tshao* (ink plant or *Eclipta alba*)<sup>10</sup> during the seventh or the eighth month and extract its juice. Mix one *shêng* (about 1 pint) of the juice with the ingredients and leave to dry.

<sup>1</sup> See p. 332.

<sup>3</sup> No. 921 in Wieger (1911).

<sup>2</sup> *Yin Chen-Chün*. . . , p. 25 b.

<sup>4</sup> Read (1936), no. 330.

<sup>5</sup> *Ibid.* no. 457, also Stuart (1911), no. 383; a tonic.

<sup>6</sup> No. 156 in Read (1936) and no. 140 in Stuart (1911); a diaphoretic, tonic and purgative.

<sup>7</sup> Nos. 512 and 507 in Read (1936) and no. 398 in Stuart (1911); a tonic and lenitive.

<sup>8</sup> No. 90 in Read (1936) and no. 335 in Stuart (1911); a diuretic, antirheumatic, astringent and tonic.

<sup>9</sup> No. 250 in Stuart (1911); a tonic.

<sup>10</sup> No. 160 in Stuart (1911); an astringent said to tighten the teeth.

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Take 1 *shêng* (1 pint)<sup>1</sup> of almonds (*hsing jen*), put it in 5 *shêng* (pints) of good wine contained in a silver vessel and heat until the almond loses its bitter taste. Heat half a *shêng* (about half a pint) of the juice extracted from *sêng ti huang* (*Rehmannia glutinosa*),<sup>2</sup> 5 oz of soya bean curd (*chen su*) and 5 oz of deer glue (*lu chio chiao*)<sup>3</sup> together, grind the mixture to powder and put it into the previous liquid.

Warm the liquid and the mixture gently and then introduce the five ingredients. Stir vigorously with a comb made from the wood of a willow-tree (*liu pi*). At the appropriate degree of dryness make the product into pills by hand. The pills should be about the size of the *wu thung tzu* (nuts from *Sterculia platanifolia*). The dosage is 30 pills a day taken with wine, but this can be varied to suit the circumstances. Avoid eating pork, garlic, mustard and turnips (at the same time).

We cannot find anything in the above formulary other than mild tonic agents.

The *Hsüan Chieh Lu* is the oldest printed book in any civilisation on a scientific subject.<sup>4</sup> It was first issued by Hokan Chi (possibly its author) between +847 and +850.

Let us first recapitulate the points which have been touched upon in this study. The belief that it was possible to prepare an elixir of immortality from metallic and mineral substances, as vital as quicksilver and as permanent as the rocks and hills, was ancient and classical in China. Partly because the operations required for its preparation were expensive, and partly because emperors and high officials throughout the ages considered themselves eminently suitable for survival, the alchemists tended naturally enough to congregate in the neighbourhood of courts and to throng the vestibules of the great. In the Tang period the prolongation of life by elixirs became a veritable *idée fixe*, and each imperial reign tended to follow a cyclical order of events, the incoming emperor fortified by Confucian advisers executing the alchemists to whom was attributed the demise of his predecessor, but gradually himself falling a prey to the pretensions of new adepts and expiring in his turn from the effects of their labours. If we are right in believing that the elixir poisoning was mainly due to the toxic properties of mercury, arsenic and lead, the last days of many Chinese emperors must have been exceedingly disagreeable.

Examples have been given in this paper of what might almost qualify as a particular literary genre, the memorials presented by Confucian scholars and

<sup>1</sup> Probably 1 lb. The two words *shêng* (pint) and *chün* (lb) if not written carefully will look very much alike.

<sup>2</sup> No. 371 in Stuart (1911); an alterative and tonic. Cf. *Pên Tshao Kang Mu*, ch. 16, p. 3 a to p. 7 a.

<sup>3</sup> No. 364 in Stuart (1911).

<sup>4</sup> Another text in the Taoist Patrology, the *Yen Mên Kung Miao Chieh Lu* (The Venerable Yen Mên's Record of Marvellous Antidotes), no. 937 in Wiegner (1911), is identical with the *Hsüan Chieh Lu*, but without the prescription for the potent anti-elixir which was itself an elixir.

ministers against the taking of elixirs. As we have seen, moreover, many emperors and high officials adopted a wisely cautious attitude towards the preparations which were offered to them. In certain cases this led to procedures which take their place in the history of regular therapeutic trials and experiments involving the use both of men and animals, a development of biological methodology in which the Chinese seem to have been at least as advanced as people in other cultures. There was also a good deal of speculation about the deleterious effects of elixirs, sometimes following the lines of the characteristic category theories of Chinese alchemy, but sometimes recognising (as early as the + 11th century) that intimate association between high toxicity and powerful beneficial action which was to impress Paracelsus so greatly five hundred years later. As the physicians in China were never affected by the Galenic orthodoxy which permitted the use of plant drugs alone, they continued from early times to prescribe metallic, mineral and animal substances, but it seems fairly clear from a comparison of medical with alchemical tractates and treatises that the posology of the doctors was generally much more conservative and cautious than that of the alchemists. At the same time many of the latter were very aware of the dangers of elixir poisoning, and sought, either by means of category theory or by the compounding of what they believed to be effective antidotes, to minimise or to avoid it. By the Ming period (+ 16th century) alchemy in China had gone into a profound decline, leaving the victory to the pharmaceutical naturalists, who fulminated against elixirs of any kind whatsoever.<sup>1</sup>

It is evident that this general picture does not correspond at all with the course of events in Europe. While in the Western Middle Ages and early Renaissance poisoning by alchemical elixirs was by no means unknown, it never played the same prominent part as in China.

If one turns over the pages of a work such as Lynn Thorndike's *History of Magic and Experimental Science* one is hard put to it to find much to the purpose. For example, about + 1360 Thomas of Bologna made an elixir from gold and mercury which 'was reputed something sinister', and he was suspected of trying to poison kings and dukes.<sup>2</sup> A hundred years or so later anonymous alchemical letters assert that a single drop of the elixir of projection has wonderful medicinal

<sup>1</sup> This was not the converse of the victory of the Chymists over the Galenists in Europe, for the pharmaceutical naturalists throughout Chinese history had dealt with mineral and animal drugs equally with those of plant origin—what they finally succeeded in stopping was the massive alchemical dosages of poisonous metals and minerals.

<sup>2</sup> Cf. Thorndike (1923-58), vol. 3, pp. 611 ff.

properties, but if it is made from mercury and sulphur instead of 'water of gold' it will be corrosive and poisonous. At Florence one Alexander Tarentinus and his servant Arnelius died instantly from the effects of such a poisonous elixir.<sup>1</sup> But so little did these toxic phenomena enter into medieval European alchemy that the very word 'poison' will scarcely be found in the indexes of works devoted to the history of the subject.

Perhaps the great reason for this difference is that Europe did not have the same conception of *material* immortality as China. In the West there was a rather clear idea of human survival after death which derived from origins both Hebrew and Christian; heaven, hell and even purgatory were real for both Latins and Greeks in Christendom. The elixir of life, though acculturated to some extent from the Islamic world, where it had been hardly more at home and certainly derived from further east, was always far less important than the philosopher's stone which would transmute the ignoble metals into gold. From the time of the mystical proto-chemists<sup>2</sup> of the Hellenistic world onwards, projection by the Stone was primarily for the purpose of acquiring material wealth (even though this might be idealised as eleemosynary in aim). At the same time we need not deny that the operations could be, and doubtless often were, undertaken with the parallel purpose in mind of purifying the soul of the operator from spiritual dross just as the lead or iron was freed from its base elements and raised to the level of gold.<sup>3</sup> Prolongation of life, rejuvenation, longevity and well-being in old age some tincture derived from the Stone might give, but where could an alchemical immortality, properly speaking, be spent? This world, so often castigated by the preachers as a justly uncomfortable antechamber to heaven, was hardly inviting enough to recommend itself, and the next was already departmentalised to the full.

Far different were the Chinese conceptions. Of an individual 'soul' there was no clear conviction in any of the great Three Doctrines. Confucianism had always declined to discuss personal survival, in the explicit interest of high social morality in the here and now,<sup>4</sup> while for Buddhist philosophy the belief in an individual

<sup>1</sup> *Ibid.* vol. 4, p. 347.

<sup>2</sup> [On these 'aurifactors', cf. pp. 76, 284 above, and p. 416 below.]

<sup>3</sup> As is well known, the psychological interpretation of alchemy has received an epoch-making treatment in the hands of C. G. Jung. Here we shall only refer however to the brilliant book of Eliade, which sets this very strikingly in the context of all alchemy and practical chemical technology from ancient times onwards. [In China also there was a long-standing distinction between the chemical art (*wai tan*) and the physiological training (*nei tan*), but, as we shall show elsewhere, the latter was equally practical, not allegorical-mystical as in the West.]

<sup>4</sup> Cf. *SCC*, vol. 2, p. 13.

persisting soul was a positive heresy.<sup>1</sup> The Taoists, most relevant in the context of alchemy, recognised a considerable number of spiritual essences, even godlings, in the human body-soul complex, almost as many indeed as the limbs and viscera of the human organism itself, but there was no place other than earth for them to inhabit as a coherent entity, and after death they simply dispersed, some rising to join the *pneuma* (*chhi*) of the heavens, some sinking to mingle with that of the earth, and others disappearing altogether.<sup>2</sup> But there had also been from the beginning of Taoism in the Warring States period, as far back perhaps as the – 5th century, a firm belief in immortals (*hsien*), ethereal purified beings, originally feathered like birds, possessed of magical powers and wandering for ever without material needs among the mountains and forests, there eternally to enjoy the contemplation of the beauty of Nature, the outward and visible form of the Tao. This state of bliss, in which his spiritual components were purified but not dispersed so that a man remained recognisably himself, could be attained by him through the practice of specific Taoist techniques. By no means all of these were forms of asceticism as the West understood it, for they comprised not only dietary regimen and abstentions, but also gymnastic and sexual techniques, forms of heliotherapy, liturgical rite and sacrifice, and last but not least pharmaceutical procedures in which the making of elixirs was paramount.<sup>3</sup> Now one begins to understand the importance of the ‘water of life’, *soma-hraoma*,<sup>4</sup> Kuan-Yin’s *amṛta*,<sup>5</sup> the drug of deathlessness (*pu ssu chih tshao*), the gold elixir (*chin tan*), in Chinese thought. Where else could the individual in medieval China turn? Heaven or paradise in any seriously credible sense did not exist, but the visible world was eternal and uncreated, nor would it ever cease, and he who could make himself worthy might continue to enjoy it with sense-perceptions perpetuated but purified. This was the inner meaning of the proverbial salutation *wan shou wu chiang* (‘Life world without end!’). Thus the temptation to believe the claims of the alchemists was in China particularly strong, and one can see that an almost heroic Confucian austerity must sometimes have been needed to prevent men of high poetic sensibility not only from taking an elixir themselves but from inducing those near and dear to them to take it too.

As for the alchemists themselves, we are not disposed to over-estimate the

<sup>1</sup> Cf. *SCC*, vol. 2, p. 401.

<sup>2</sup> Cf. *SCC*, vol. 2, p. 153 and further Maspero (1950).

<sup>3</sup> See further Maspero (1937).

<sup>4</sup> See Renou & Filliozat (1947), vol. 1, pp. 347 and 355; cf. also Dubs (1947).

<sup>5</sup> Cf. Masson-Oursel *et al.* (1933), p. 159.

number of conscious charlatans among them. The urge to investigate the chemical behaviour of bodies was probably at least as great in medieval China as in other times and places, and so strong was the faith in the feasibility of elixirs that many an alchemist must himself have fallen a martyr to his own beliefs, or even to mistakes in following the obscure and contorted instructions of his predecessors. Indeed it would probably not be going too far to suggest that the elixir mania may have acted as a real inhibiting factor for the progress of chemical knowledge during the medieval Chinese centuries, for often no doubt the most experienced or industrious experimenters were the most enthusiastic believers and in the end the surest victims. The story of the death and resurrection of Wei Po-Yang is the epitome and type of this.

But if such were the miseries of Chinese alchemy, its grandeur lay in the fact that unlike that of Europe it was from the beginning iatro-chemistry. Ko Hung and Tuku Thao needed no Paracelsian Luther<sup>1</sup> to persuade them that the true business of alchemy was not to make gold but to make medicines. The Chinese alchemists, not only in outstanding examples like Thao Hung-Ching and Sun Ssu-Mo, but normally and universally, had always been pharmacists at the same time. And if the elixir of material immortality proved in the end to be as much of a will-o'-the-wisp as perpetual motion (or has it yet done so?), Chinese iatro-chemistry was destined to be subsumed in due time into the universal science of modern chemo-therapy.

<sup>1</sup> Though Paracelsus in the +16th century will always remain the standard-bearer of this movement, it is now realised that certain alchemists of the +14th really initiated it, notably John of Rupescissa (fl. +1325 to +1350); cf. Multhaus (1954*a*), Jacob (1956), Pagel (1958), pp. 263 ff.