

SINO-TIBETAN STUDIES

VOLUME I

BERTHOLD LAUFER



COLLECTED BY
HARTMUT WALRAVENS

PREFACED BY
LOKESH CHANDRA

SINO-TIBETAN STUDIES

Selected papers on the art, folklore, history, linguistics
and prehistory of sciences in China and Tibet

by

BERTHOLD LAUFER

Collected by HARTMUT WALRAVENS

Preface by LOKESH CHANDRA

Volume 1

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PREFACE

This volume is a collection of some writings of Berthold Laufer on the art, folklore, linguistics, technical literature and chronology of China and Tibet. The forte of Laufer was the prehistory of science in East Asia, with special reference to the interflow of scientific knowhow between India, Iran, Tibet and China. Herein are included his research papers on turquois, optical lenses, asbestos, cubeb, odoric, mandragora and Arabic and Chinese trade in walrus and narwhal ivory. A long paper on Si-hia phonology represents a major attempt to decipher the script and language of the Tanguts.

Laufer was born on 11 October 1874 in Köln. He was attracted early in his youth by oriental languages and ethnography. Finally he concentrated on East Asian languages. He studied Chinese, Malay, Tibetan and Japanese. In 1897 he did his doctorate from Leipzig on a short version of the Hundred Thousand Nagas (Klu-ḥbum). He got a welcome chance as Prof. Franz Boas of the Columbia University, New York, made him the leader of the Jesup North Pacific Expedition to Sakhalin and Amur (1898-99). In 1901 he led the Jacob H. Schiff Expedition to China. In 1904 he was appointed Assistant in Ethnology at the American Museum of Natural History, New York. From 1905 to 1907, he lectured on anthropology and East Asian languages at the Columbia University. In 1908-10 he led the Mrs. T. B. Blackstone Expedition to China and Tibet and collected a large number of xylographs and books for the Newberry Library in Chicago, in 21,403 fascicles, in Chinese, Manchu, Tibetan, Mongolian and Japanese in the fields of religion, philosophy, history, literature, linguistics and art. For the John Crerar Library in Chicago he collected Chinese works on geography, law, commerce, industry, economy, sociology, medicine and natural sciences. On a short visit to Tokyo, he obtained a large number of Japanese colour prints for the Field Museum.

Besides being a dynamic and resourceful collector, he wrote 490 books and articles (Walravens 1976:lxix f.). Just as he had wandered in China and Tibet in his youth, in later years he traversed along the forgotten pathways of East Asian languages, literatures and scientific developments. His excursions into the prehistory of botany and agriculture, chemistry and zoology, mining and mineralogy, textiles and ceramics, warfare and engineering, optics and physics unfold to our fascinated gaze a vast panorama of the beginnings of science and technology in the larger framework of human civilisation. While first and foremost a humanist and linguist, his studies of the development of sciences though dated are still fundamental. They stand out because of the use of original texts in several Asian languages like Chinese, Tibetan, Mongolian, Manchu, Sanskrit, Malay, Persian and Turkish. He has unravelled how valuable plants and goods of China were transmitted to the Mediterranean area. He has provided information on Iranian plants, animals, minerals, customs and institutions from records in Chinese. His *Sino-Iranica* on Chinese contributions to the history of civilisation in ancient Iran, with special reference to the history of cultivated plants and products, has world-historical significance. Moreover, it shows how Indian products, their names and technologies travelled to China. The first Chinese ambassador Čaň K'ien to an Indian court in 138 B.C. brought the Indian name of pomegranate 塗林 *t'u-lin*, **du-lim* to China (Laufer 1919:282). He points out that in A.D. 647 the Chinese Emperor T'ai tsuñ sent a mission to Magadha to learn the technique of sugar production (ib. 377). He details Sanskrit elements in the Persian pharmacology of Abu Mansur Muwaffaq (ib. 580). His translation of the Citralakṣaṇa from the Tibetan Tanjur (Walravens 1976:xlvi no.167) deals with Indian techniques of painting. He brought together 4,000 rubbings of inscriptions from China, now in the possession of

the Chicago Field Museum. Among them are also the estampages of Sanskrit inscriptions in China (Walravens 1980:521).

In 1976 Hartmut Walravens collected the papers of Laufer in two volumes of the *Kleinere Schriften von Berthold Laufer* (1444 pages). We are grateful to Walravens for putting together some more of his writings in this volume. This volume does not exhaust his research papers on the pre-history of fascinating subjects like the bird-chariot (85), spectacles (91), maize (116), groundnut (117), vaccination (140), finger-prints (174, 233, 458), diamond (208, 483), ink (319), aviation (338, 380), television (339), polo (381, 384, 408), civil service examinations (402), lemonade (456), etc. The figures in brackets refer to the serial numbers in the bibliography of Walravens (1976:xxix). We hope that some day it will be possible to put all of them in further volumes.

Lokesh Chandra

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Hartmut Walravens, Berthold Laufer and his rubbings collection, JAOS.100.4

THE NAME CHINA

BY

BERTHOLD LAUFER.



The discovery of Prof. HERMANN JACOBI makes it obligatory upon us to subject to a new revision our former views with reference to the origin of the name China. Prof. JACOBI finds in the *Kauṭīliya* a mention of China, more specifically the record of the fact that silken ribbons are produced in the country of China, and concludes: "The name *Cīna* is hence secured as a designation for China in B. C. 300, so that the derivation of the word China from the dynasty of the Ts'in (B. C. 247) is definitely exploded. On the other hand, this notice is of interest also as proving the export of Chinese silk into India in the fourth century B. C." ¹⁾ As Prof. JACOBI informs us ²⁾, the work here utilized affords a sure chronological basis, as the author Kauṭīliya was the famous minister of King Candragupta who seized the reins of government between B. C. 320 and 315, so that the composition of his work must be dated around B. C. 300, and several years earlier rather than later.

The facts leading up to the opinion that the name China (Tsina) is traceable to the Chinese dynasty of *Ts'in* which flourished B. C.

1) H. JACOBI, Kultur-, Sprach- und Literaturhistorisches aus dem Kauṭīliya (*Sitzungsberichte der K. Preuss. Akademie*, XLIV, 1911, p. 961).

2) *L. c.*, p. 954.

246—207 are well known. The *Periplus Maris Erythraei* written between 80 and 89 A. D. by an unknown author is the first book of classical antiquity in which the name *Thinai* (Θῖναι) is mentioned; Ptolemy (around 150 A. D., Bk. VII, Ch. 5) follows with *Sinai* (Σῖναι), likewise Marcianus of Heraclea (around 350 A. D.); and Kosmas Indikopleustes (around 545 A. D.), in his *Topographia Christiana*, speaks of *Tzinitza* (elsewhere *Tzinista*), in which the Persian *Cīnīstān* and the Sanskrit *Cīnasthāna* are evidently reflected. The identification of the name China with that of the 'Ts'in dynasty has first been proposed by the Jesuit Father Martin Martini in his *Novus Atlas Sinensis* (Vienna, 1655). The last to have discussed the problem ably and thoughtfully from all sides is Prof. PAUL PÉLLIOT (B.E.F.E.O., Vol. IV, 1904, pp. 143—150), to whose thorough discussion the reader may be referred for all detailed arguments involved in the case.

I may first be allowed to call attention to a few facts which have hitherto been overlooked in a consideration of the problem. I am convinced that Martini is not himself the father of the etymology set forth by him, but that it was expounded by the Chinese themselves, and further, that it arose in Chinese Buddhist circles.

The Lama C'os-kyi Ņi-ma dPal-bzañ-po (Dharmasūrya Çṛībhadrā) completed in 1740, shortly before his death, an important historical work known under the abbreviated title *Grub-mt'a Ņel-kyi me-loñ*, "Crystal Mirror of the Siddhānta"¹⁾ in twelve chapters. Chapters 9 and 10 deal with the development of Buddhism in China and give an exposition of the teachings of Confucius, of Taoism and Islam.

1) The full title is: *Grub-mt'a t'ams-cad-kyi k'uñs dan adod ts'ul ston-pa legs dbad Ņel-kyi me-loñ*, "Source-book (*k'uñs* = Skr. *ākara*) of all Siddhānta and crystal mirror of fine sayings (Skr. *subhāshita sphatikādarśana*) teaching the manner of right aspirations". As indicated by this title, the biographical method is adhered to, and the book is mainly composed of sketches narrating the lives of Buddhist saints and dignitaries. It abounds also in bibliographical data and renders good services for the study of Buddhist literature.

The Lama had gathered his information from a study of Chinese sources during a residence of more than three years at Peking and received for his work high marks of honor from the Emperor K'ien-lung. His account of China is extremely interesting and spiced with the salt of his personal judgment. It has been translated ¹⁾ by Sarat Chandra Das ²⁾ who was unfortunately not in a position to identify the Chinese names which are merely transliterated in their Tibetan garb. The tenth chapter is introduced by the following paragraph ³⁾:

"The name of China in its own language is Sen-teu (chin. *shên* 'u 神土, the land of the spirits ⁴⁾). It is identified by some authors with the Dvīpa Pūrvavideha ⁵⁾. The people of India call it Maha Tsina, *mahā* meaning great, and *Tsīna* being a corruption of Ts'in. Among the sovereigns of China, Shi-huang, king of the country of Ts'in, became very powerful. He conquered the neighboring peoples and made his power felt in most countries, so that his name as king of Ts'in became known in remote regions of the world. In course of time, by continual phonetic alteration, the name Ts'in passed into Tsiu and then into Tsina or Tsīna, whence the Sanskrit designation Maha Tsīna (Great China)."

We notice that the view of the Tibetan author is identical with the one upheld by those among us who stood for the etymology *China* — *Ts'in*, — assuming that the fame of that dynasty was so widely spread over the countries west of China that its name was

1) Paraphrased, it would be more correct to say. All translations of Chandra Das have been made by means of a Lama explaining to him the text in colloquial Tibetan or Hindustani. Difficult passages are, for the sake of simplicity, thrown overboard; and wherever it pleases the translator, his own remarks and explanations are freely mingled with the text.

2) J. A. S. B., Vol. XLI, Part I, 1882, pp. 87—114.

3) *L. c.*, p. 99.

4) Frequent designation of China in Buddhist literature.

5) Tib. *Lus ap'ags glin*, one of the four fabulous continents located east of Mount Sumeru.

applied by outsiders to the country of the Chinese. It is most improbable that this opinion was formed in the mind of the Lamaist writer himself; he availed himself in Peking of Chinese books for the compilation of his notes on Buddhism and culture in China, according to his own confession, and as indicated by the character of these notes, and it therefore is most likely that he encountered this view in a Chinese author; it is also plausible to assume that this was a Buddhist source. It may be worth while to trace this passage to its Chinese original, and to ascertain the time when this theory gained ground in China. Such a Chinese tradition could certainly not be adduced as pure evidence for the correctness of the etymology. It may be an afterthought, and savors of the reflection of a Buddhist priest who tried to find an explanation for the word *Cīna* met in Buddhist Sanskrit texts or heard from his Indian colleagues. At all events it is interesting to observe that the whole theory is not merely one of European fancy, but that it has been seriously entertained in the East.

The existence of such a tradition among the Buddhists of China is evidenced by the fact that China is indeed styled *Ts'in* by Buddhist writers (*e. g.* Fa Hien, LEGER's translation, pp. 15, 23). But in my opinion, in these cases, the word *Ts'in* is simply used as a phonetic equivalent of the Sanskrit word *Cīna*. They cannot be utilized as evidence to show that *Ts'in*, in the eyes of the Chinese, independently from the Indian designation, was ever employed by them as a name of their own country. The case is merely one of retranslation, not one of original preëxistence. The Chinese Buddhists encountered the name *Cīna* in Sanskrit texts, and first of all, transcribed it *Chi-na* 支那 or 指那 (hence the *Shina* of the Japanese) or *Chên-tan* (Cīnasthāna¹), and in the attempt to trans-

1) ERTEL, *Hand-Book of Chinese Buddhism*, p. 176, and PELLLOT, B.E.F.E.O., Vol. III, p. 253 note.

late it, or to coin a simple term for it, most happily hit upon the word *Ts'in* 秦. The word *Ts'in* was subsequently read into the word *Cīna*, doubtless suggested by the similarity in sound, but this is by no means evidence for the word *Ts'in* having given the impetus to the word *Cīna*. Whether, as M. PELLIOU¹⁾ is inclined to think, in the case of the early pilgrims, the Land of *Ts'in* should be associated with the small dynasty of the Posterior *Ts'in*, seems rather questionable. But the case of the *Lalitavistara*²⁾ should be excluded from the evidence, as it is doubtful whether the *Cīna* of the Sanskrit text is really there intended to designate China; it is much more likely that the *Shina*, a tribe of the Dard, are involved³⁾.

One of the several objections that could be raised against the derivation of China from *Ts'in* is that the Chinese people never called themselves after the *Ts'in* for whom their scholars professed a thorough contempt, while they freely named themselves (and still do so) "sons of Han", or "Han people", and in the south also "T'ang people"⁴⁾, after the Han and T'ang dynasties. I am not aware of the fact that any designation like *Ts'in jên*, people of *Ts'in*, in the

1) B.E.F.E.O., Vol. III, p. 434, note 4.

2) B.E.F.E.O., Vol. IV, p. 149.

3) *T'oung Pao*, 1908, p. 3, note 5. — The passage revealed by Prof. Jacobi is apt to remove another doubt. "The mention of the *Chinas* in ancient Sanskrit literature", says HENRY YULE (*Encycl. Britannica*, 11th ed., Vol. VI, p. 188), "both in the laws of Manu and in the *Mahābhārata*, has often been supposed to prove the application of the name long before the predominance of the *Ts'in* dynasty. But the coupling of that name with the *Daradas*, still surviving as the people of Dardistan, on the Indus, suggests it as more probable that those *Chinas* were a kindred race of mountaineers, whose name as *Shinas* in fact likewise remains applied to a branch of the Dard races". The mention of silk made in the *Kautiliya* leaves no doubt that it is really China which is there referred to.

4) G. SCHLEGEL's statement (*Notes and Queries*, Vol. II, p. 78, 1868) that the name *T'ang shan* 唐山 for China was introduced by the Java-Chinese who named themselves *T'ang jên* hardly covers the whole case. The Japanese as early as in the *Kōjiki* (712) and *Nihongi* (720) speak of China as the land of T'ang, and the *Tabgač* of the Turkish inscriptions denoting China seems to be derived from the name of T'ang (HURU, Nachworte zur Inschrift des Tonjukuk, p. 35 note).

general sense of Chinese, has ever been traced in any Chinese record. But curiously enough, this is once the case in a passage of the Japanese *Nihongi*. Under the year 540 A. D., an influx of Chinese immigration into Japan is there mentioned: "The men of Ts'in and of Han etc., the emigrants from the various frontier nations were assembled together, settled in the provinces and districts, and enrolled in the registers of population. The men of Ts'in numbered in all 7053 houses. The Director of the Treasury was made Hada [Japanese reading for Ts'in] no Tomo no Miyakko" ¹). Aston comments on this passage in a note as follows: "Ts'in and Han are the Chinese dynasties so called. These men must have been recent emigrants from China to Korea, or their near descendants who had not yet been merged in the general population. This statement throws light on Japanese ethnology. It shows that not only the upper classes, as appears from the 'Seishiroku', but the common people contained a large foreign (Chinese and Korean) element". Presumably, a distinction is here made between two classes of Chinese, Ts'in or Han, according to the territories from which they came, and though the name of Ts'in is, in the *Nihongi*, restricted to this passage, it shows that the tradition of the name of the Ts'in dynasty was still alive at that time, and that there were then Chinese called after the Ts'in. But altogether, this passage is of such a late date that no forcible argument can be built on it.

The foundation on which the theory of a relationship between *Cīna* and *Ts'in* was based is indeed not very solid, and the argument of Prof. Jacobi should be weighty enough to compel us to abandon this position entirely. If the word *Cīna* occurs in a Sanskrit author of around B. C. 300, it must have been known in India before this time, and it is then difficult to see how the house

1) W. G. ASTON, *Nihongi*, Vol. II, p. 38.

of Ts'in which was a small principality of no importance at that period could have come into play in the formation of the name. There is no reason to believe that the word *Cīna* had its origin in China or its foundation in a Chinese word. It is very possible that it arose in India or in Farther India. We shall certainly not return to the feeble hypothesis of v. Richthofen which is plainly refuted by M. PELLIOT¹), to whose arguments I readily subscribe; indeed, I had arrived for myself at the same conclusion independently from M. Pelliot. Etymologies are surely scientific problems of the second or third order, and those relating to tribal and local names will usually remain unsatisfactory. The one fact clearly stands out that the series of names headed by *Cīna* or *Tsīna* and followed by the classical names *Thīnai* or *Sīnai* and finally ending in our word China spread along the maritime route of the Indian Ocean, in opposition to the names *Sēres* and *Sērikē* by which China became known in the west overland. The same duplicity of names, owing to the peculiar geographical position of China, is repeated during the middle ages when the name Cathay became known from overland travelers and was believed for centuries to be a country distinct from China, until the journey of the Portuguese Benedict Goës in 1603 determined that both were one and the same. A similar irony of fate was playing in the times of Greek and Roman antiquity when the general impression prevailed that *Sēres* and *Sīnai* were two matters diverse. In either case, we have two groups of names, a continental and a maritime one, the former relative to the coherent land mass of northern China, the latter more distinctly pointing to the coast regions of southern China. It appears from a remark of I Tsing, the Buddhist pilgrim who started in 671 from Canton on a voyage to India, that *Chi-na* more specifically related

1) B.E.F.E.O., Vol. IV, p. 141.

to Canton, and *Mahācīna* to the imperial capital Ch'ang-ngan¹). Thus, it may not be impossible that *Cīna* has been the ancient (perhaps Malayan) name adhering to the coast of Kuang-tung Province and the coast-line farther to the south, in times anterior to the settlement of the Chinese in those regions. The lack of ancient Malayan records prevents us from ascertaining the origin and meaning of the word.

1) E. CHAVANNES, *Voyages des pèlerins bouddhistes*, p. 56 (Paris, 1894).

FIVE NEWLY DISCOVERED BAS-RELIEFS OF THE HAN PERIOD

BY

BERTHOLD LAUFER.

(With Four Plates.)



To the courtesy of Mr. L. Wannieck in Paris I owe five rubbings from stone bas-reliefs of the Han period recently discovered in Shantung and, as I understand, offered for sale on the Peking market. These stones are not apt to arouse any particular interest; the representations exhibited on them present nothing new in principle, but merely well-known subjects and designs. This feature, however, lends them a certain secondary interest in that it reveals again and confirms the fact that the Han sculptors worked after fixed ready-made models, and that their productions were composed of quite typical scenes and figures of a limited range of variability. The question which remains to be solved is as to when and how these stereotyped designs came into being, whether and to what extent they were preceded by a creative period of less conventional art, and what agencies had influenced its beginnings and development. In the present state of our knowledge, we can merely raise these questions; the scanty material which has survived does not yet allow us to formulate them in a conclusive manner. It would be premature to regard the bas-reliefs known to us as falling under the best

productions of the art of the Han epoch; the term "art", at least, should not be emphasized, and it rather seems to me that they represent the output of artisans or craftsmen who catered to the every-day demands of the public and copied from more elaborate works of greater artists whose achievements are lost to us.

The scene on Plate I bears a familiar aspect. In the second zone a couple of dancers and a pair of drummers are in the centre of the action. The drum-pole is stuck into the figure of a wooden striped tiger serving as base, as on the bas-relief No. 151 or 158 in CHAVANNES' *Mission archéologique*; it closely agrees with the latter, except that the position of the drummers and dancers is exchanged, and that there is perhaps a still higher degree of conventional stiffness around these figures. The first on the left is a woman *en face*, the lower portion indicating the skirt being outlined in the shape of a rectangle with concave sides, no attempt being made to draw the feet. In the row above, six sitting men — one on the right being broken off owing to a mutilation of the slab — are forming the orchestra, the one in the centre holding the lyre which is leaning against the railing exactly in the same manner as on No. 163 of *Mission*. The two musicians on the right-hand side seem to brandish bells or castanettes in their uplifted right hands. The lower zone contains the familiar kitchen-scene: to the left two fellows kneading dough in a trough, a cook on his knees preparing a fish and another stirring with a poker the fire in a stove with one cooking-hole over which a kettle of trapezoidal form is placed. We here have again the representation of a musical and dancing entertainment accompanied by a solemn repast, — in honor of the dead.

The stone reproduced in Plate II, unfortunately much effaced, shows another variant of the motive "The Search for the Tripod Vessel", four other representations of which have become known (LAUPER, *Chinese Grave-Sculptures*, p. 24, and *Mission*, No. 122 and 148).

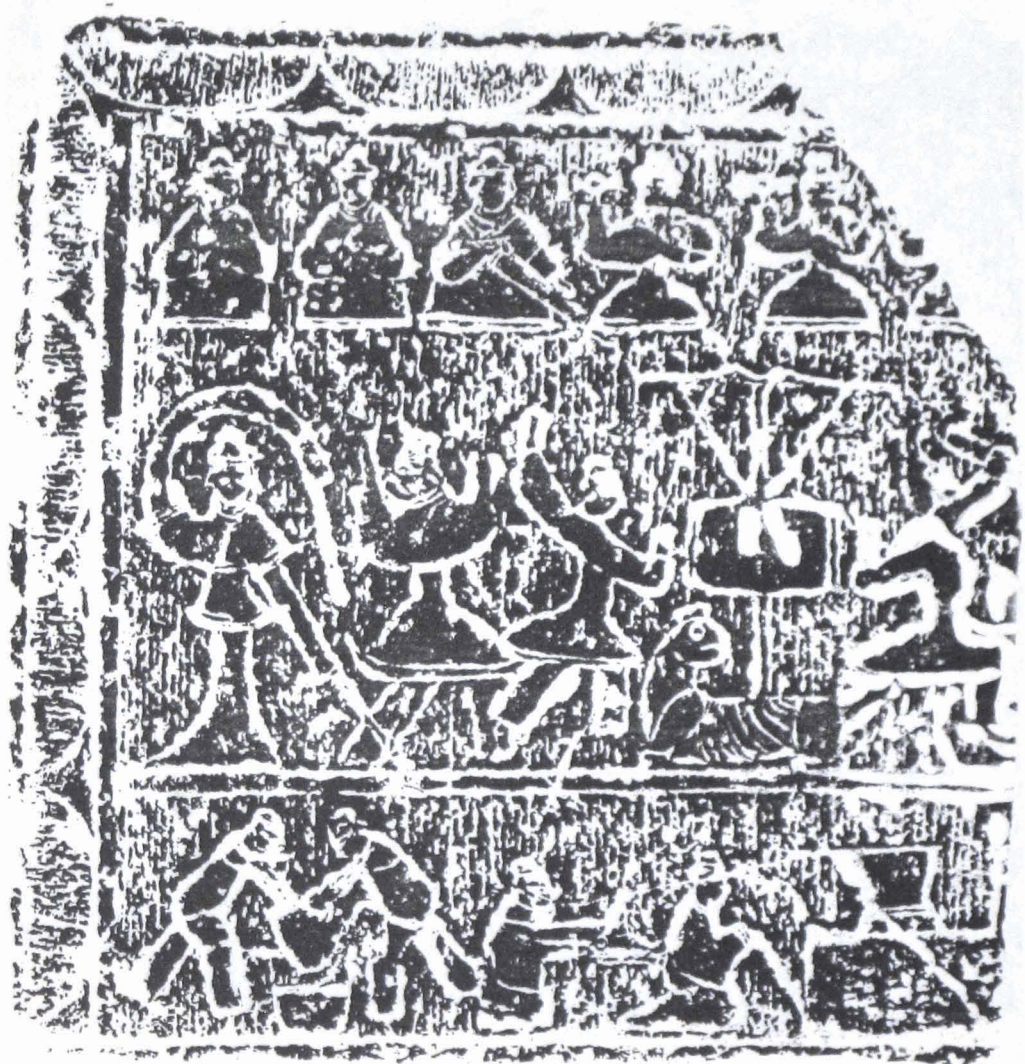


PLATE I.

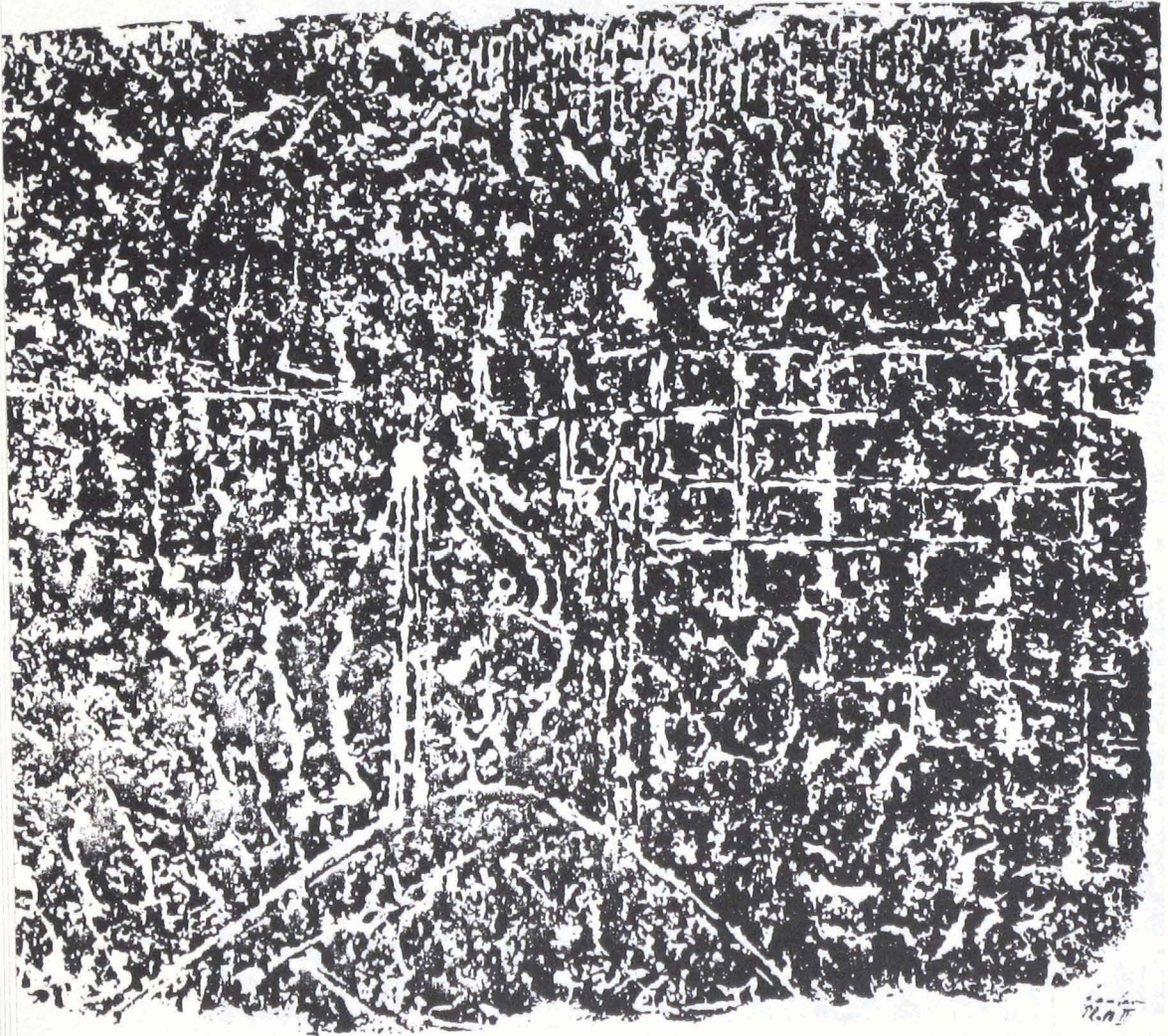


PLATE II.

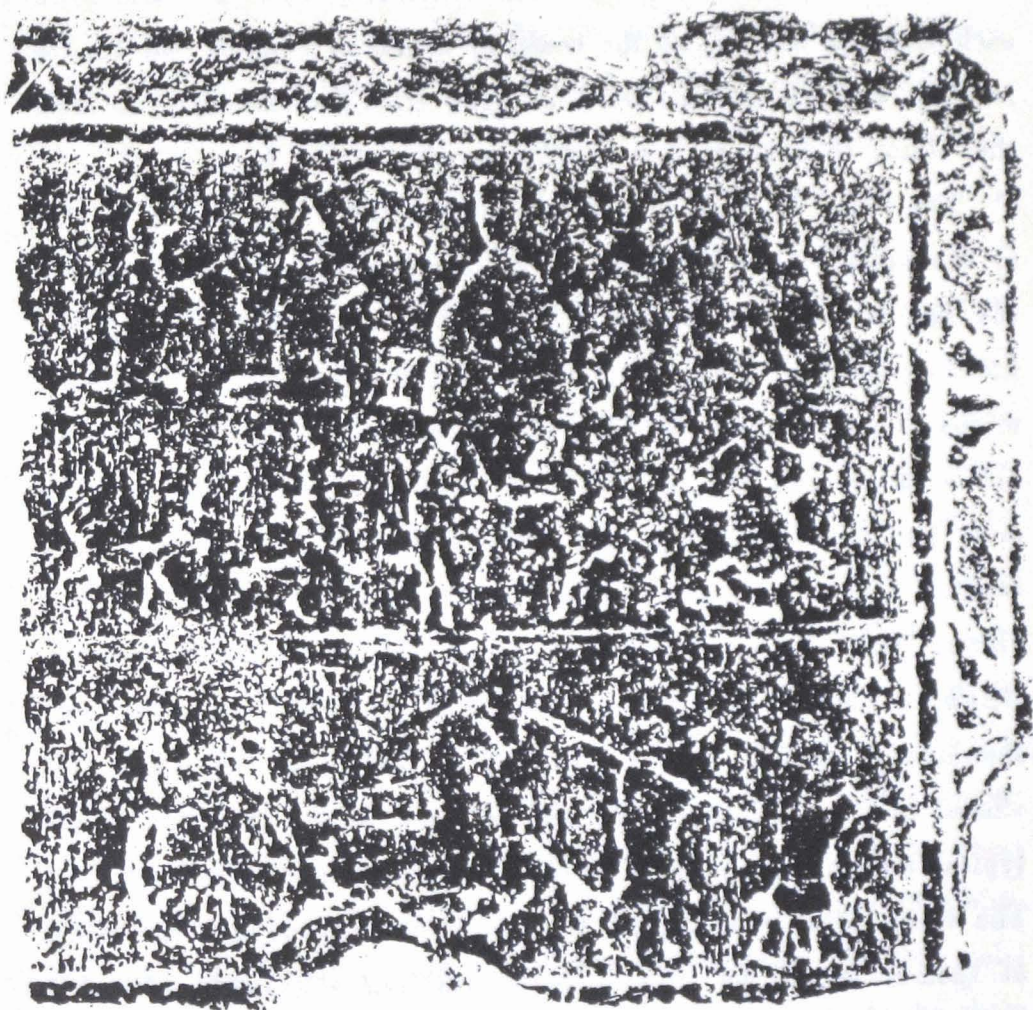


PLATE III.

The bank of the river is here walled up with rows of stones or bricks as in the corresponding subject of the Hiao-t'ang shan, and the presence of water is symbolized by the large figure of a fish and two boatmen managing a canoe with long oars. Three men on each side are hauling up the vessel by means of a pulley; the bronze is plain and undecorated here. Judging from the various repetitions, this seems to have been a favorite subject of the time.

The relief of Plate III is divided into three panels. The centre of the upper one is occupied by a sitting person of dignity seizing the handle of a hoe-shaped implement. He is surrounded by two kneeling men on either side. The second zone is filled with representations of animals, two walking quadrupeds on the left, the first with bushy tail presumably being a fox; in the middle two hares standing erect and pounding drugs in a mortar, the well-known lunar story familiar from the sculptures of the Hiao-t'ang shan; and a frog viewed from the back brandishing two objects in the front-paws. Below, a chariot holding two inmates is preceded by two footmen shouldering spears. A close parallel to the entire composition is offered by No. 162 in CHAVANNES' *Mission*, to the exclusion of the typical hunting-scene there added in the fourth zone at the lower end. The three upper ones contain the same scheme in the same succession of themes as in the present case: kneeling attendants around a conspicuous dignitary, then animals, foxes, a bird and the drug-pounding hares again (see also *Mission*, No. 161), finally chariot with equestrian and spear-bearer on foot. A more abridged version of the same composition will be found in *Mission*, No. 176.

The central part of the oblong stone slab (1.64 × 0.81 m.) shown on Plate IV is entirely damaged, but so much has survived on the two ends that the category of subjects to which this relief must have belonged may be well defined. A palace-like structure has evidently occupied the lost central portion, as visible from the

ends of the roofs and some pillars on the left-hand side, and as indicated from some human figures sitting under the roof and a pair of peacocks perching on the top of the roof, the large tail-feather of the one overshadowing an owl which occurs also on the Hiao-t'ang shan (*Mission*, No. 46, on the right-hand side of the roof). The two peacocks on the roof are a typical motive (*Mission*, No. 45, 46, 107, 129, 170; LAUFER, *l. c.*, p. 29); here, an additional peculiar feature is involved in that the two birds are holding jointly in their beaks an ornament apparently consisting of a twisted leather or metal band to which coins are attached. A curious analogy occurs on the relief No. 150 of CHAVANNES' *Mission* where likewise two peacocks are holding what seems to be an interlaced string of coins. The remains on the right-hand side of the stone in Plate IV allow us to recognize the *ho-huan* tree populated by birds, a horse standing in its shadow as in the representations of Wu Liang's tomb (*Mission*, No. 77, 107, 129, and LAUFER, *l. c.*, p. 7). It is therefore very likely that also this bas-relief is to be counted among the same class of subjects to which the late Dr. Bushell lent an individual color by defining them as "The Reception of Mu-wang by Si-wang-mu"; we may briefly style them "The Royal Reception". Opposite the horse, the outlines of a chariot may still be recognized. The style and technique of this relief comes very near to the work on Wu Liang's tomb, while the three others differ from it and approach the stones of Tsi-ning chou, Tsin yang shan and the others of *provenance inconnue* in CHAVANNES' *Mission*, though I am inclined to think that the three in question are still cruder in execution.

The fifth of the stones to be considered here is not worth reproducing, as it exhibits nothing new. A procession of four plain open chariots surmounted by an umbrella and each carrying two inmates and drawn by a single horse are followed by two horse-

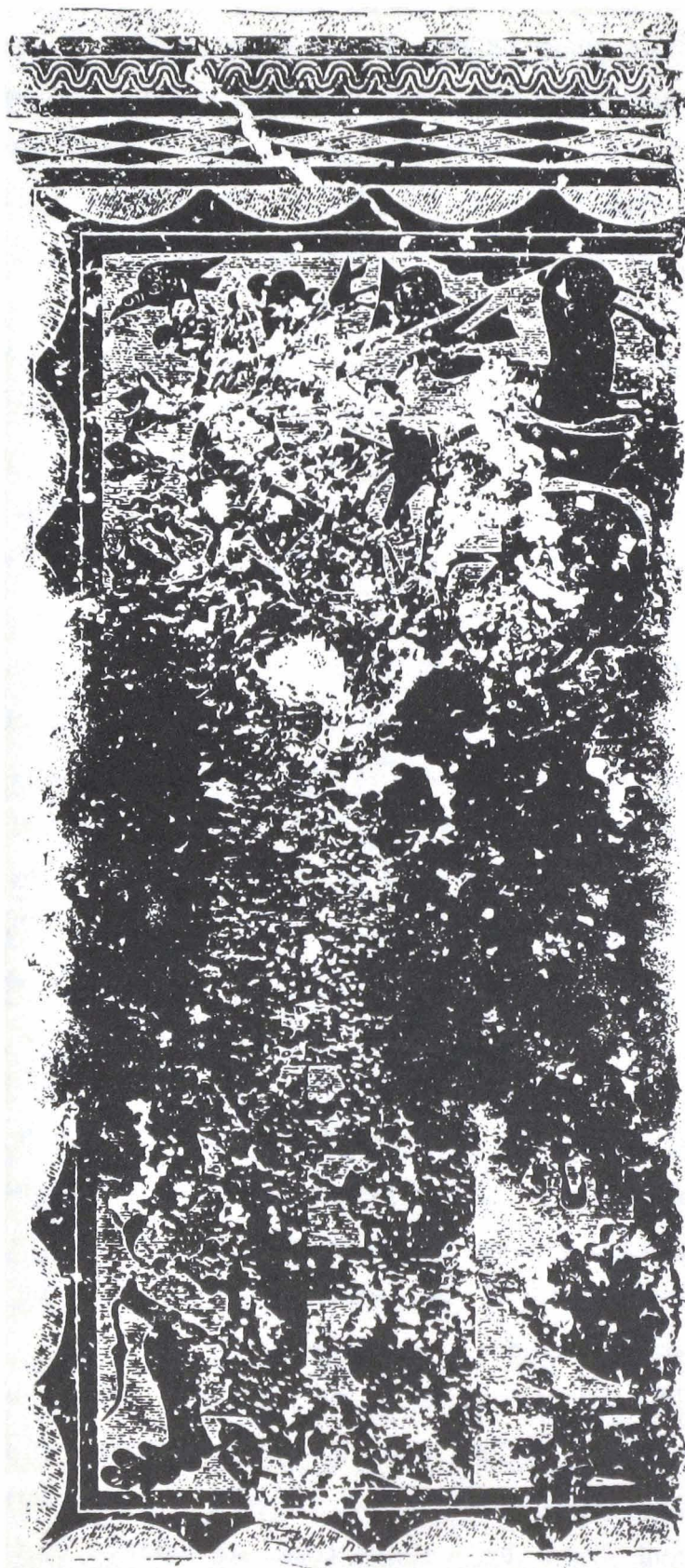


PLATE IV.

back-riders. The six horses, although not badly outlined, are all represented in the same trotting position. For the representation of horses, chariots, trees, birds, human figures in various postures etc., the Han stone-carvers certainly availed themselves, as insisted on also by Chavaunes, of a number of stereotyped patterns which turn up over and over again.

None of these five stones contains any inscriptions or explanatory labels which make the fundamental value of the Wu Liang reliefs. It seems that only for prominent men, or for those who could afford it, such more elaborate inscribed carvings were produced; and it is probable that, the lower a man was in the social scale, the plainer was the decoration of the slabs constituting his grave-chamber. But also in these designs for the people the artistic spirit which awakens with elementary force in the Han period is not entirely lacking, and the *naïveté* with which the artists sometimes seek to overcome certain difficulties is nearly touching. I here have especially in mind the design displayed on the left half of the stone No. 182 in CHAVANNES' *Mission*. The subject is a rainstorm, — a surprise to meet in the age of the Han, as it anticipates an intention of the later landscapists. The artist did not venture to express the raindrops, but employed three means to describe his inspiration: two flocks of birds are hurriedly taking refuge from two directions under the branches of a stately tree filling the centre of the picture; two women are walking along protecting themselves against the rain with open umbrellas and evidently experiencing a hard struggle against a raging storm, especially the woman in front who is leaning far back; finally, the tree is vehemently agitated by the wind, its trunk and branches being set in vivid motion, — a good achievement in "life's motion" 生動. Another peculiarity of Han art may be studied in this naïve forerunner of a landscape, and this is the curious parallelism of the bodies and motions of

the two women with the outline and motion of the trunk of the tree. In the reproduction of Chavaunes there is a line visible due to a fold in the paper rubbing. In covering up the illustration above this line, it will be noticed that the three figures are almost identical, that the two women could be supplemented into a tree and the tree into a woman. A similar parallelism of design is manifest in No. 178 where the two triangular trees in the corners are adapted in shape to the two roofed pillars of the house. This subject deserves a close examination in connection with a study of the laws underlying the art of the Han. It will be seen that there are different causes and factors leading to the conventionalization of design, that outward conditions as well as inner forces working in the mind of the artist must be equally called into account.

From this point of view, — the study of the psychological foundation of art, — the new bas-reliefs here noticed may claim their importance; they furnish us further material to decide what is typical and conventional in this art, what is individual and popular, and how popularity of certain subjects effecting a larger output tends to form a factor in the direction of conventionality.

THE DISCOVERY OF A LOST BOOK

BY

BERTHOLD LAUFER.



The literary history of the *Kêng chih t'u* 耕織圖 "Illustrations of Husbandry and Weaving" is well known in its outline. This work contains a series of forty-five wood-engravings¹⁾ and is divided into two sections, twenty-one illustrations being devoted to the successive stages in the cultivation of rice, and twenty-four to the processes of silkworm-rearing, spinning, weaving, and manufacture of brocade. The album was published by command of the Emperor K'ang-hi in 1696 under the editorship of Tsiao Ping-chên 焦秉貞, an assistant in the Astronomical Board and a talented painter.

1) HIRTH (*Fremde Einflüsse in der chinesischen Kunst*, p. 57, and *Scraps from a Collector's Note Book*, p. 26, or *Young Pao*, 1905, p. 398) states that there are forty-six engravings, in agreement with the *Kuo ch'ao hua ch'eng lu* (see below). The Sung edition had only forty-five, as remarked also by WYLIE, and so had also the K'ang-hi edition of 1696 (see *Chinese Pottery of the Han Dynasty*, p. 29, Note). The forty-sixth cut which is N°. 7 in the present editions seems to be a later addition, which, however, must have been made before 1739, the date of the publication of the above mentioned Chinese work. Besides the editions enumerated by me, I now know of another lithographic print published 1879 in Shanghai by the office of the *Shên Pao Gazette* 申報館, which is preferable to the Shanghai edition of 1887.

The employment of the flail in threshing is proof that these pictures illustrate the mode of agriculture as practised in middle and southern China. In the north the flail is unknown; the farmers around Peking do not even know what it is. In traversing northern China from east to west, one meets the flail for the first time in the territory of Szech'uan; along the western border of this province, the Tibetan tribes have adopted the flail from their Chinese neighbors.

As far as I am aware, A. WYLIE (Notes on Chinese Literature, p. 93) was the first to call attention to a *Kêng chih t'u shi*, published in 1210 by a certain Lou Shou 樓壽. This consisted of forty-five engravings, with a stanza appended to each. "It was recut during the K'ien-lung period, and a few lines of poetry added to each plate by the emperor. The engravings are good specimens of art, and accurate representations of Chinese customs," remarks Wylie. *K'ien-lung* apparently is a slip of the pen for *K'ang-hi*. But there can be no doubt that Wylie meant to express the opinion that the work of 1696 was merely a reedition of that of 1210. HIRTH (Scraps etc., p. 26) says regarding this point: "Each illustration is accompanied by a little poem, which may possibly be of much older date, since a work of the same title, also consisting of illustrations and descriptive poetry, containing forty-five engravings, was published as early as 1210. This does not involve, of course, that K'ang-hi's work was not a new creation."

It was not so difficult to arrive at a certain conclusion, as regards the literary interdependence of the two works, for the text of the book of Lou Shou (without the engravings), as already indicated by WYLIE (l. c., p. 263*b* supra), is reprinted in the collection *Chih pu tsu tsai ts'ung shu*. While collating the two books in 1905, I noticed that the title and letterpress description in poetry accompanying each plate of the *K'ang-hi* edition was literally copied from the older book of the *Sung* period; so that at that time (l. c., p. 29) the conclusion was warranted that "the *Sung* engravings also may have been kept intact rather than subjected to radical changes." A collation of the illustrations of the two editions would have been a matter of great importance, as Hirth had recognized in the drawings of Tsiao Ping-chên a tendency towards correct observation of perspective which he attributed to the influence of European art transmitted by Jesuit painters at the Imperial Court. The case is

a strong one, for as Hirth tells us, the painter's biographer adds that, "in placing his figures, the near and the far corresponded to the great and the small without the slightest fault." And HIRTH himself continues: "This we may interpret as meaning that as a member of the Astronomical Board he became, of course, acquainted with his European colleagues, the Jesuits who held office in that Institute, and who may have taught him the rules of perspective." A full translation of the passage alluded to by Hirth will be found in GILES, *An Introduction to the History of Chinese Pictorial Art*, pp. 170-171¹⁾. It will be a matter of justice to emphasize that it is the Chinese author Chang Kêng 張庚 himself who traces the art of Tsiao Ping-chên to the newly introduced foreign style of Matteo Ricci. The case is certainly much more validated if

1) As neither Hirth nor Giles give the text of this curious document which is of some importance in that it signals the beginning of a new phase in Chinese art, it may find its place here. It is contained in the *Kuo ch'ao hua chêng lu* 國朝畫徵錄 (Ch. II, p. 7) published in 1739 in 3 vols. by Chang Kêng 張庚 from Siu-shui 秀水 in Kia-hing fu, Chekiang. 焦秉貞濟寧人欽天監五官正工人物其位置之自近而遠由大及小不爽豪毛蓋西洋法也。康熙中祇候內庭聖祖御製耕織圖四十六幅。秉貞奉詔所作村落風景田家作苦曲盡其致深契聖衷錫賚甚厚旋鏤板印。

白苧村桑者曰。明時有利瑪竇者西洋歐羅巴國人通中國語來南都居正陽門西營中畫其教主作婦人抱一小兒爲天主像神氣圓滿采色鮮麗可愛嘗曰中國祇能畫陽面故無凹凸吾國兼畫陰陽故四面皆圓滿也。凡人正面則明而側處即暗染其暗處稍黑斯正面明者顯而凸矣。焦氏得其意而變通之然非雅賞也。好古者所不取。

such a view is upheld by a Chinese art-historian than by one of us. It is almost immaterial what we are inclined to see in Chinese pictures; in order to understand them, we must know how the Chinese view them.

The case, therefore, was such that in 1906 I was led to write: "At all events, to settle the question of a possible Jesuit influence in the *K'ang-hi* drawings, as proposed by Hirth, it would be necessary to submit the edition of 1210 to a minute comparison with the former." Now I am luckily in a position to do so, as the engravings of Lou Shou are before me.

This work seemed to be entirely lost, and when I returned to China in 1908, I made many vain attempts to trace it in Peking, being charged by the Newberry and Crerar Libraries of Chicago with the task of building up a Chinese and Tibetan library¹). Making a flying book-hunting trip to Tōkyo, I was surprised to discover that several bookstalls there had hidden treasures of old Chinese books which cannot be supplied any more in Peking, and readily disposed of them at rates far below the Peking standard. It was there that I obtained an ancient Japanese print of excellent execution which, on closer inspection, proved to contain the forty-five wood-engravings of Lou Shou²). My preliminary remarks on this work are without pretensions and as brief as possible. I have for some time been in correspondence with Dr. Otto Franke of Hamburg on the subject of the *K'eng chih t'u*, as he is planning to publish a complete critical edition of the work. I suggested

1) The two Libraries are now in possession of 36,000 Vols. of Chinese, Japanese, Manchu, Mongol and Tibetan books which will make them strongest on this line in America. They have good copies of the Tibetan Kanjur and Tanjur, the Chinese Tripitaka in 7900 Vols. of the Palace Edition of 1738, the *T'u shu tsi ch'eng*, *T's'e fu yüan kuei* etc., and abound in first editions and early prints of the Sung, Yüan and Ming periods. In Manchu literature, they have many rare and unique works not to be found in any library of Europe.

2) This book is now in the John Crerar Library of Chicago and entered as C 41.

to Dr. Franke to reproduce the *Sung* and the *K'ang-hi* editions in comparative views, each *Sung* picture being confronted with the corresponding later reproduction. As I am myself loaded with material to work up for years to come, I am pleased to see Dr. Franke take up this task, and to be myself freed from the duty of making a lengthy report.

The pages of this book measure 18×27.5 cm. It has no printed title-page. It opens with a preface on the history of illustrations of agriculture and weaving 耕織圖記, dated at the end 1462 天順六年 and written by Wang Tsêng-yu 王增祐, Provincial Judge of Kuang-si. A brief preface with biography of Lou Shou on four pages follows, the characters being interspersed with Katakana signs, written in 1237 by Lou Shao 樓杓. In the table of contents, the illustrations are designated as those of Lou Shou. There is no statement in this edition to indicate the date of its publication; but there is a written postscript on two pages in the form of a eulogy and dated 1676 延寶 (Empō) 丙辰. The book, accordingly, must have been printed between 1462 and 1676, in all probability shortly before the latter date.

The *Kêng chih t'u* of Lou Shou was incorporated in the *Yung-lo ta tien*, and there was in the Library of the Emperor K'ien-lung a copy presented by the governor of Che-kiang¹⁾. Lou Shou hailed from Yin hien in the prefecture of Ning-po in that province. The fact that an edition of his engravings was preserved in the *K'ang-hi* period does not now require any evidence from literary records, but is ascertained on the ground of inward evidence from the present Japanese edition. It becomes a living witness for the fact that Tsiao Ping-chên must have had it before his eyes and modeled from it his pictures, one by one. Consequently, it is no matter of

1) *K'in ting se ku ts'üan shu tsung mu*, Ch. 102, p. 13. It is curious that the *K'ang-hi* edition is not made mention of in the Imperial Catalogue.

surprise that an original or later Ming edition of Lou Shou should have survived and have faithfully been republished in Japan before 1676. I say faithfully, for there are many reasons to believe that these engravings executed in a masterly style present good and exact reproductions of the Sung original, if for no other reason, just for the one that they breathe the genuine spirit and style of the Sung masters. Also their technique, as I can vouchsafe from other prints and wood-cuts of the Sung, exhibits the peculiar flavor of that epoch. As works of art, and in their very quality as wood-engravings, they are far superior to the K'ang-hi reproductions which suffer from a forced mannerism, and are pictorial in character, being copies of paintings, and not book-illustrations.

The surprise experienced in comparing the two editions is great, but it is simultaneously a task very instructive and full of esthetic enjoyment. First of all, it is gratifying to observe that Hirth's view of a Jesuit influence in the work of Tsiao Ping-chên is splendidly confirmed. In the Sung pictures there is not an atom of the entire perspective spectacle so ostentatiously displayed in the backgrounds of the K'ang-hi illustrations. All those shortened fields and roads, the quite un-Chinese attempt at representing a plain, are here lacking and replaced by that most characteristic phenomenon of the art of the Sung, — scenery.

To illustrate this point, I may be allowed to reproduce here one of these cuts; I select the one representing the Rice Harvest, because it will allow readers not in possession of Tsiao's *Kêng chih t'u* to compare it with Hirth's reproduction (in *Scraps*, p. 26, or *Fremde Einflüsse*, p. 58). Here then we see a landscape of hills, acacia and magpies, in elegantly curved lines, making the background. We also notice that, aside from this principal difference, the motive is the same in both representations, and that identical means are employed to illustrate the story. There are the same principal actors on both



The Harvest. From a Series of Wood-Engravings by Lou Shou (1210).

sides. The stout land-owner leisurely protecting himself with an umbrella is comfortably watching his laborers. Three mowers are at work cutting the blades with their scythes, while a carrier is going to shoulder a pole from the ends of which two rice-bundles are suspended. Tsiao has chosen the next step in his activity and shows him going away across the road, in order to obtain space in the foreground for placing a genre-picture: a boy lazily reclining on his back pulling another by his coat, while two other boys carrying rice-bundles, though in different postures, appear also in the Sung illustration.

Another addition of Tsiao, on the upper left-hand side, is the farmer's house with two children in front of it. But just the volitional alterations which he has made are sufficient proof for his having worked after the model of the Sung pictures. On the latter, a boy holding a basket is approaching the mowers, evidently to provide them with some refreshment, as indicated also by the teapot and two cups placed on the roadside; Tsiao has dropped this figure. He has, further, introduced changes in the headdresses, expressions, and attitudes of the single persons. His land-owner is bare-headed, short-bearded, clad with loose short-sleeved jacket open in front, and with straw sandals; he has his body slightly leaning forward. The *Sung* country-squire is standing straight, with the dignity of a patriarch heightened by his long full beard, his large eyes resting on the mowers, and his angular cap; his coat with long drooping sleeves is girdled, and he wears shoes. The cane of his parasol is exceedingly long, which may have been a peculiar feature of the Sung time. The shapes of the scythes also are at variance, — and so in many other cases we are able to make observations revealing traits and characteristics of Sung culture ¹). The three mowers are

1) I am especially interested in a high bronze candelabrum standing on the floor to be found on N^o. 6 of the Sung pictures illustrating textile art, because I obtained a similar

represented in different stages of their work: the first is just grasping a few blades, the second is cutting (note the exact coincidence on both sides in the representation of the act), the third has just done cutting in the Sung picture, while in that of K'ang-hi he is pausing in the act of cutting, looking at No. 1 who has turned back to gaze at the approaching master. This conception of Tsiao somewhat savours of a theatrical effect, as does also the boyish trick on the opposite side. The thought of the Sung artist is plainer and more dignified, but doubtless also more conformable to the subject, which is the harvest. Simplicity is always the true keynote of Chinese art. It is noteworthy that the conical straw hat on one of the farmers in the K'ang-hi illustration is absent in that of the Sung period which covers the head of one with a hood, and that of his neighbor with a kerchief.

In other illustrations, the coincidences and similarities are still more numerous and striking. Thus, the very first scenes of ploughing and furrowing are almost exactly copied by Tsiao. In the second portion dealing with weaving, the agreements are much stronger, as the activities connected with this work are mostly indoor, and Tsiao's schooling in perspective found less food here, though he attempted to draw the houses in correct proportions.

pair of bronze candelabra excavated last summer near Ho-nan fu,¹ which, for technical reasons, must be attributed to the Han period. Tsiao has omitted this object, probably for the reason that it was out of use during his time or unknown to him; indeed, it is not found any more in northern China. It seems to have still occurred under the Ming, as I infer from a beautiful painting of T'ang Yin (1477—1523) recently reproduced in colors at Shanghai; there, a poet is interpreting a song to a musician with a lute who is listening devotedly and reflecting on a suitable tune; a bronze candelabrum is placed behind the table, and the light of the burning candle coated with red wax sheds a rosy glimmer over the room. — On another of the Sung illustrations, an artificially raised dwarf pine-tree is depicted. This is not, as still generally believed, a Japanese invention, but a Chinese production. I am not aware of the fact that the age of this curious practice has ever been established; it is interesting to note, at all events, judging from this drawing, that it goes as far back as the Sung period.

Tsiao has added, throughout, a number of little genre-scenes as by-play, *e. g.* a boy playing a flute and sitting astride a buffalo, in another case a child crawling on all fours over a buffalo's back, or a boy carrying a pail and barked at by a dog, or chickens swallowing grain on the threshing-floor or even climbing into a basket filled with rice (a chicken-family occurs also on one of the Sung pictures). Then he has made an addition of spectators. In the first illustration, he lets the wife and two children of the land-owner peep out of the door, and the weaver is watched by two curious lookers-on. In the Sung engraving showing the cutting of the mulberry-leaves, a man is standing on a ladder and cutting the leaves with a knife. Tsiao has a man standing on a branch of the tree gathering the leaves in a basket; the wind is drifting them to the ground, and a boy below is picking them up. And he could not resist the temptation to draw another laborer in the act of ascending another tree.

It is interesting to note the type of woman created by Tsiao in distinction from the Sung women who are short and broad-faced. Tsiao has produced an idealized, tall, slender-bodied type of woman with oblong oval face of aristocratic mould. Many portraits of his of women have survived, and as far as I am aware, this type occurs, with this exception, only in the paintings of Lêng Mei. It is somewhat out of place that these ideal figures are placed here among the rustic scenes, for if this type occurs at all in reality, which may well be doubted, it certainly does not occur in the country.

A peculiar feature of the Sung picture, clouds in the familiar ornamental forms covering the summits of trees and the roofs of houses, is entirely discarded by Tsiao. On the other hand, it is remarkable that in several cases where the Sung artist is content with a tree and a few rushes as background, Tsiao is eager to sketch a mountain-range dense with vegetation and filled with water and

bridges, differing widely in style from the traditions of the T'ang, Sung and Yüan.

A comparative study of these engravings gives rise to manifold considerations. We are here introduced into the workshop and the working methods of a Chinese artist, having before us his model and his own accomplishments. We are now privileged to enter his mind and thoughts, and to examine what he borrowed, and what he retained. A psychological analysis may eventually lead us to discover why he changed, and why he endorsed the work of his predecessor.

MÉLANGES.

THREE TOKHARIAN BAGATELLES.

1. A Chinese Loan-Word in Tokharian A.

The word for "town" in the Indo-European language designated as Tokharian A is *rĭ*, with short or long vowel, capable of forming a plural *rĭ-s*. The word was pointed out by the first decipherers of the language, E. SIEG and W. SIEGLING.¹ EMIL SMITH, in his very interesting analysis of the Tokharian vocabulary,² has justly observed that the word *rĭ* cannot satisfactorily be explained as coming from any Indo-European language, and that the alternative form with the lengthening of the vowel might speak in favor of a foreign origin,

¹ *Tocharisch, die Sprache der Indoskythen* (S.B.A.W., 1906, p. 923). I do not agree with these authors in regarding the language as that of the Indo-Scythians, but side with the conservative views expressed on the subject by A. MEILLET (*Le Tokharien, Indogerm. Jahrbuch*, Vol. I, pp. 1—19). The ingenious supposition of F. W. K. MÜLLER (S.B.A.W., 1907, p. 960) still lacks the precise documentary evidence. The mere attestation of the fact that an Uigur colophon mentions the translation of a Buddhist work from an Indian language into Tokharian does not yet prove substantially that the fragments now styled Tokharian by way of convention really belong to that language, although this possibility may be admitted. The fact itself, that Buddhism and Buddhist literature existed among the Tokharians, certainly was not novel, but previously known. Tāranātha has preserved to us the names of four members of the Buddhist clergy in Tukkāra (Tibetan T'o-gar; with popular etymology also T'o-dkar; *dkar*, "white"), — viz., Ghoshaka; the Vaibhāshika teacher Vāmana (Tibetan Miu-t'ui, "dwarf;" mentioned also in *dPag bsam ljon bzau*, p. 88); the ācārya Vibhājyavāda; and Dharmamitra, a teacher of the Vinaya (pp. 61, 78, 198 of the translation of SCHIEFFNER), — and he twice refers to the Buddhism of Tukkāra (*ibid.*, pp. 38, 282). According to the Index of the Kanjur (ed. I. J. SCHMIDT, p. 78, No. 513), the original text of the Ārya-pratītya-samutpāda-hridaya-vidhi-dhāraṇī, from which the Tibetan translation was made, had been procured from Tukkāra by the Bhikshu Ner-ban (Nirvāna?)-rakshita.

² "*Tocharisch*" *die neuentdeckte indogerm. Sprache Mittelasiens* (*Videnskabs-Selskabets skrifter*, 1910, No. 5, p. 15, Christiania, 1911).

as the long vowels, with the exception of *a*, rarely or hardly ever occur. Smith tentatively proposed a relationship of the Tokharian word to Tibetan *ris* ("quarter"), remarking that *ri* is the present and probably very ancient pronunciation of the latter. Without discussing the possibility of a contact between Tokharian and Tibetan, this suggestion is not convincing for two main reasons. The Tibetans are an essentially nomadic group of tribes, to which the notion of a town in its origin was entirely foreign; and it may be considered as certain that at the time when the Tokharian word was in existence the Tibetans had only a few towns. The T'ang History relates that the inhabitants of Tibet roam about tending their herds, without having fixed settlements, while there are but a few walled places (其人或隨畜牧而不常厥居然頗有城郭, *Kiu T'ang shu*, Ch. 196 A, p. 1 b). The Tibetan designation for a settlement of any size, though it consist of a single or several habitations, is *gron* (written language also *gron-kyer*), but the word *ris* is never applied in this sense. It is even very far from signifying "quarter" unceremoniously, but means "part, division," usually in a figurative, not in a strictly territorial sense, and as a rule appears only as the second element of a compound. It therefore seems to me that the Tokharian word *ri* has no chance to claim its derivation from Tibetan *ris*. If, however, the former should really be a loan-word, it would appear more probable and reasonable to look to Chinese for assistance and to correlate the Tokharian word with Chinese *里* (Korean and Japanese *ri*), "a village comprising twenty-five or fifty families." The Chinese, as energetic colonizers in Central Asia, may well have exerted their influence upon the native population there in this direction.

This word thus far is the only Chinese loan-word discoverable in Tokharian; in going over its vocabulary at least I could find no others. As has justly been said by A. MEILLET,¹ "Le tokharien n'est pas de ces langues qui sont fortement sujettes à l'emprunt; le vocabulaire est indigène pour la plus grande partie, autant qu'on puisse le voir par les faits déjà connus."

2. A Tokharian Loan-Word in Chinese.

The earliest (and still common) Chinese designation of asafoetida,² *a-wei* 阿魏 (Japanese *agi*), traced by HIRTH to the Annals of the Sui Dynasty,³ in which it is mentioned as a product of the Kingdom of Ts'ao 漕, has not yet been explained. Hirth observes that "*a-wei* is a foreign word, derived

¹ *Mémoires de la Société de linguistique de Paris*, Vol. XVII, 1912, p. 292.

² Belonging to the genus *Ferula*, comprising some sixty species (see WATT, *Dictionary of the Economic Products of India*, Vol. III, pp. 328—337).

³ HIRTH and ROCKHILL, *Chau Ju-kua*, p. 325. The same text is also in *Pei shi*.

presumably from the Sanskrit or Persian name of the drug." This supposition, at the outset, is not very probable, as the Sanskrit and Persian terms have been traced in Chinese, and are indeed supplied by Hirth himself: Sanskrit *hingū* is handed down in the Chinese transcriptions *hing-kū* (**hing-gu*) 興霍, *hing-yü* (*hing-nü*) 形虞, and *hün-k'ü* (**hün-gü*) 薰渠,¹ and Persian *anguṣṭa(d)* انگڑد or انگڑه, in Chinese *a-yü* (-*tsie*) (**a-nü-zi*) 阿虞(截).² Watters says with reference to the *Pên ts'ao kang mu* that *a-wei* is wrongly given as the Brāhman or Sanskrit name. This statement, however, is not made by Li Shi-chên, the author of the *Pên ts'ao* (Ch. 34, p. 21). Whereas he expressly notes that *a-yü* is a Persian term, and that *hing-yü* is a word used in India, he fails to state from what language the word *a-wei* is derived. He indicates that it makes its first appearance in the *Pên ts'ao* of the T'ang period, and treats us to a wonderful etymology of the name: "The barbarians themselves style it *a*, expressing by this exclamation their horror at the abominable odor of this gum-resin."³ This is sufficient to warrant the conclusion that Li Shi-chên was ignorant of the language from which the word had sprung. He further imparts a Mongol word *ha-si-ni* 哈昔泥,⁴ and, what is more important, another transcription *yang-kuei* 央匱, not mentioned by Hirth or Watters. The *Nirvāṇasūtra* (*Yen p'an king* 涅槃經) is cited by him as the source for this word, and apparently the *Mahāparinirvāṇasūtra* is understood.⁵ *Yang-kuei*, in my opinion, is the same as *a-wei*; that is to say, the two are variants, representing transcriptions of an identical foreign prototype. This one we encounter in Tokharian B *aṅkwa*, first pointed out in the plural form *aṅkwaṣ* by M. S. LÉVI from one of the documents of

¹ HIRTH, *l. c.*, and *J.A.O.S.*, 1910, p. 18; WATTERS, *Essays on the Chinese Language*, p. 440.

² Also the Sanskrit loan-word *hiṅ* occurs in Persian (L. LECLEERC, *Traité des simples*, Vol. I, p. 448). The Tibetan equivalent *šin-kun* must be explained from **šin-kun* (assimilated to *šin* by way of popular etymology: *šin*, "tree"), the latter from **hiṅ-kun* (= Sanskrit *hingū*), derived from a mediæval vernacular of India.

• 夷人自稱曰阿此物極臭阿之所畏也 (*wei* 畏, pun upon *wei* 魏).

³ This word is not listed in the Mongol dictionaries of Kovalevski and Golstunski. It is nothing but a transcription of Ghazni or Ghazna 鶴悉那, the capital of Zūbulistāu (CHAVANNES, *Documents*, p. 160), which, according to Hüan T'ang, was the habitat of the plant (HIRTH, *l. c.*). According to I-tsing (TAKAKUSU's translation, p. 128), *asafoetida* was abundant in the western portion of India.

⁴ This entire foreign nomenclature is ascribed to a poem of Fan Ch'êng-ta 范成大 (1126-93) in K'ang-hi's Dictionary (under 魏).

medical contents secured by the Mission Pelliot.¹ The element *yañ* 央, as is known, represents the syllable *añ* in the Chinese transcription of Sanskrit words; for instance, in *Aṅgulimālya*. *Kuei* 匱 is North Chinese, as compared with an older articulation *kwai* or *kyai*, as still preserved in Cantonese; so that *yang-kuei* 央匱, read in the T'ang period *añ-kwai*, is a phonetically exact transcription of a word corresponding to Tokharian *añkwa*. The same holds good for the transcription *a-wei*: *a* 阿 answers to Sanskrit *a* in the method of Buddhist transcriptions; the character *wei* 魏, as far as I know, has not yet been pointed out among the latter, but it had the ancient pronunciation *kwai* (鬼), *gwai*, and *nwai*, also *nui*. In this manner, also this mode of transcription leads back to Tokharian *añkwa*. From a phonetic point of view it is interesting to note that the pair *yang-kuei*—*a-wei* meets with an analogous counterpart in the name of the fig (*Ficus carica*) discussed by HIRTH,² *yang-ji* (**añ-it*) 映日 and *a-yi* (**a-jit*) 阿驛, both answering to a West-Asiatic name of the general type *anjir*; also in this case we have a double mode of transcription following similar lines, as in the previous instance, — the nasal after the initial vowel being expressed in the one form and omitted in the other, — so that we are entitled to the conclusion that the element *a* 阿 served also for the reproduction of the initial syllable *añ* or *an* in foreign words during the T'ang period.

Another Tokharian term of botanical pharmacology is of great interest to us. This is *awirāk*, the designation of the myrobalan *Terminalia chebula*.³ First of all, we receive from it a satisfactory clew as to the mysterious Tibetan name *a-ru-ra* (corresponding in meaning to Sanskrit *haritaki*),⁴ which comes nearer to the Tokharian form than to any form of other languages known to us. Second, new light falls upon the Chinese transcription *ha-li-lo* 訶梨勒, first mentioned at the end of the third century in the *Nan fang ts'ao mu chuang*.⁵ This word has been brought together with Arabic *halilag* هليلج by T. WATTERS,⁶ and with Aramaic *halilag* הלילג by HIRTH.⁷ Persian *halilah* هليله, also *balil* and *balila*, should be added. As the genus

¹ *Journal asiatique*, 1911, Juillet-Août, p. 138.

² *J.A.O.S.*, 1910, p. 20.

³ S. LÉVI, *l. c.*, p. 122.

⁴ H. LAUFER, *Beitr. tibet. Med.*, pp. 56—67. GARCIA AB HONTO (*Aromatum Historia*, 1567, p. 132) gives as Indian popular name *arare*, and as medical term *aritiqni*. Compare the Anglo-Indian word *hara-nut*. *Haritaki* is transcribed in Chinese 訶梨恒難. In Newari the name of the plant is *halala*.

⁵ See BRETSCHNEIDER, *Bot. Sin.*, pt. 1, p. 38.

⁶ *Essays on the Chinese Language*, p. 355.

⁷ *J.A.O.S.*, 1910, p. 23.

Terminalia is indigenous to India, however,¹ it is manifest that the West-Asiatic names, in the same manner as the Chinese and Tibetan ones, are derived from a language of India, and that there is no necessity of resorting to Persian, Aramaic, or Arabic for an explanation of the Chinese name. The Tokharian form *arirāk* demonstrates that the prototype on which the derivations of West-Asiatic, Chinese, and Tibetan are based, indeed pre-existed somewhere on Indian soil. Chinese *-li-lo* answers to an ancient articulation *-li-luk (-ri-rak)*, and very exactly reproduces Tokharian *-rirak*. The correctness of this point of view is corroborated by the word *p'i-li-lo* 毗黎勒,² corresponding to Sanskrit *vibhūṭaka* and to Tibetan *ba-ru-ra* (*Terminalia belerica*). Again in this case the Chinese and Tibetan forms are not actually based on Sanskrit *vibhūṭaka*, with which they have only the first element in common; while *li-lo (ri-rak)* and *ru-ra* appear as the second element in the same fashion as in the type *ho-li-lo—a-ru-ra*. Consequently the Chinese and Tibetan forms allow us to presuppose the former existence of an Indo-Tokharian form **virirāk*, from which the two were derived, and which corresponded in sense to Sanskrit *vibhūṭaka*. The Tokharian term *trphal* (Sanskrit *triphala*, the "three myrobalans")³ shows that a name for this kind of myrobalan must have been known.

3. Tuman.

It is well known that in New Persian a word occurs for the designation of a "myriad," *tunān* or *tomān* تومان, which with insignificant phonetic modifications, is found also in the Turkish, Mongol, and Tungusian languages of inner Asia, and which passed, most probably from Turkish, also into Magyar (*tömény, tömény, tömen*; usually in the combination *tömény-ezer*, "myriad, many thousands;" *töméntelen*, "innumerable").⁴ Whereas this word in popular use refers to an indefinite high number, the figure *x*, the supposition is

¹ The tree is abundant in northern India from Kumaon to Bengal and southward to the Deccan tablelands, and is found also in Ceylon, Burma, and the Malay Peninsula (see WATT, *l. c.*, Vol. VI, pt. 4, pp. 24—36). In Ibn al-Baitār we meet the term "myrobalan of Kabul" الهليلج الثابلي (L. LECLERC, *Traité des simples*, Vol. I, p. 131); hence our "chebuli" (YULE and BURNELL, *Hobson-Jobson*, p. 136).

² *Pén ts'ao kang mu*, Ch. 31, p. 4. It is first mentioned under the T'ang by Su Kung 蘇恭 and Li Sün 李珣.

³ S. LÉVI, *l. c.*, p. 126.

⁴ Compare Z. GOMBOCZ, *Die bulgarisch-türkischen Lehnwörter in der ungarischen Sprache*, p. 131 (*Mémoires de la Société finno-ougrienne*, Vol. XXX, Helsingfors, 1912). Gombocz, while pointing out the analogous Mongol, Turkish, and Tungusian forms, omits reference to Persian.

granted that in more exact manner of speech it should convey the notion of „ten thousand.” Marco Polo, who spoke the Persian language, is our witness of the fact that in his day *toman*, as he writes, covered this numerical category.¹ This is confirmed by the *Yüan ch'ao pi shi* 元朝秘史 (Ch. 12. p. 45, ed. of Li Wên-tien 李文田), where the word appears in the two transcriptions *t'u-mien* 禿綿 (*tūmān*) and *t'u-man* 土滿 (*tuman*), both being said to be identical, and explained as the Mongol word expressing the numeral “ten thousand” (譯言萬數也) and also an indefinite quantity (猶言眾耳). The Niüci vocabulary contained in the Ming edition of the *Hua i yi yü* likewise transcribes the Niüci word *tuman* by means of the Chinese characters 土滿.² The farther removed from the original centre of its propagation, the more was it liable, naturally, to assume the air of a fantastic aggrandizement. When, in the summer of 1898, I was engaged in the study of two Tungusian dialects, Ewunki and Oročon, in the village Wal on the north-east coast of Sachalin Island, one of my Tungusian informants gave as the highest number known to him *tumä'*, and translated it into Russian by “million.”³

Various opinions have been expressed in explanation of the word in question. H. YULE⁴ has taken it for granted that it is a Mongol word. The striking fact could not escape the students of Altaic languages that, while the cardinal numbers from 1 to 10 are different in Turkish, Mongol, and Tungusian, a curious coincidence prevails in the designations for “thousand” (Turkish

¹ Ed. of YULE and CORDIER, Vol. II, p. 192.

² W. GRUBE, *Sprache und Schrift der Juchen*, p. 35, No. 665. T. WATERS (*Essays on the Chinese Language*, p. 360) gives also the transcription *t'u-mén* 圖們.

³ This is the easternmost region to which the word has advanced. It is notable that it has been adopted only by Ural-Altaiic, but not by any Palae-Asiatic languages. The Yukaghir, for instance, have no words for numbers above a hundred, and used to express a hundred by “ten tens,” while they now employ *ičtoχ* (from Russian *sto*) and also the Russian word for “thousand” in the form *tičeds* (W. JOCHELSON, *Grammar of the Yukaghir Language*, p. 115).

⁴ *Hobson-Jobson*, p. 928. Yule (*ibid.*) has asserted also that *toman* or *tomanu*, in the sense of a certain coin or a certain sum of money (in Persia equal to ten šābqrāns or crans, about 9.75 fr.; in India equal to \$ 15.50 [G. TEMPLE, *Glossary of Indian Terms*, p. 262]; among the Ossetians equal to 10.10 Rubels [W. MILLER, *Sprache der Osseten*, p. 109]; among the Turks equal to 3 Rubels [RADLOFF, *Wörterbuch*, Vol. III, col. 1518]), is identical with the word *tuman* (“myriad”). On the authority of Yule, this has passed into our lexicography (for example, into the *Century Dictionary*). The number “ten thousand” is not visible in any of the instances given; and, in my opinion, the word in question is entirely distinct from the numeral *tuman*, and is derived from another root with a history of its own.

myñ, byñ, biñ; Mongol *miñgan*; Tungusian *miñan*) and "ten thousand" (Codex cumanicus *tumen*; Old Chuvash *tümän*; Orkhon inscriptions and Uigur *tümän*; Djagatai *tümän* **تومان**; ¹ Osmanli *tuman*; Mongol *tümän* [Old Mongol, also *tuman*]; Niüchi *tuman*; Manchu *tumen*; Tungusian dialects *tumó, tímo, tumé, tumén*; Gold *tuma, tymú*). This state of affairs must naturally raise the suspicion that these two numeral series cannot be invoked as witnesses of linguistic relationship; that, on the contrary, they are derived from a foreign source. For this reason, W. SCHOTT² and J. HALÉVY,³ the two scholars who thus far have discussed the numerals of this group in the most ingenious manner,⁴ have advisedly passed over the series *tuman* in silence, actuated as they were by a correct feeling that the question is of a loan-word. G. J. RAMSTEDT, in a study of the numerals of the Altaic languages,⁵ justly observed that the word, both in Tungusian and in Turkish, is suspicious of a late derivation; but, although referring to Russian **тыма** and **темника**, yet he thought that the original might perhaps be sought for in Indo-Chinese, pointing to Chinese *wan, man* ("ten thousand") and *ti-man* ("the ten-thousandth"). This unfortunate idea was accepted by Z. GOMBOCZ (*l. c.*) who, like Ramstedt, overlooked the existence of the corresponding Persian word. Long before the discovery of Tokharian there was no doubt in my mind that *tuman* is neither Turkish nor Mongol (and least of all Chinese), but Indo-European: the Persian word and the interesting Slavic forms were sufficient to justify this opinion. M. E. BLOCHET, in a very interesting notice *Le nom des Turks dans l'Avesta*,⁶ makes an incidental reference to the word *tümän*, stating that "it is a very ancient borrowing from the Chinese *to-man* **多萬** ('the ten thousand')." ⁷ I venture to doubt that a combination like this ever had any real existence in Chinese: it is not registered in the *P'ei wên yün fu* (Ch. 73); the notion "several or many myriads" is usually expressed by *shou wan* **數萬**. The

¹ I. KUNOS, in his edition of Suleiman Efendi's Djagatai-Osmanli Dictionary (p. 196), transcribes *tuman*.

² *Das Zahlwort in der tschudischen Sprachenklasse* (*Abh. B. Ak. W.*, 1853, pp. 1—29).

³ *L'étroite parenté des noms de nombre turco-ougriens* (*Keleti szemle*, Vol. II, 1901, pp. 6—18, 91—108).

⁴ Despite the sweeping criticism of G. J. RAMSTEDT (*Journ. de la Soc. finno-ougrienne*, Vol. XXIV, 1907, p. 2), who, as far as tangible results are concerned, has not advanced much beyond his predecessors.

⁵ *L. c.* p. 22.

⁶ *J.R.A.S.*, 1915, p. 307.

⁷ The opinion of M. Blochet is not quite clear to me. According to him, *tümän* is the older and original form (and this is also my opinion), and Persian *tumän* is intended to transcribe the Altaic word. What I do not comprehend is whether, in M. Blochet's view, the Persians or the Turks adopted the loan from the Chinese.

ancient pronunciation of *wan* was **ban*, and a Chinese *to-wan* borrowed by Turks during or before the T'ang period would have resulted in **doban* or **duban*; whereas an ancient Turkish or Mongol *tu* or *tū*, according to the phonetic rules of transcription, would always presuppose an initial aspirate on the part of modern (that is, post-T'ang) Chinese.¹ It is not necessary, however, to expatiate on this side of the argument; in the case of borrowings we have to look for motivation which is entirely lacking, and which is not produced by the supporters of the Chinese theory.

I had expected that A. MEILLET's conclusive study of the Tokharian numerals² had indeed brought us the ultimate solution of the principal issue of the problem, which in my opinion should be acceptable to all. M. MEILLET points out the numeral "ten thousand" (*tmām* in Tokharian A, and *tumane*, *tmanc* in Tokharian B), and discusses at length the Indo-European character of this word.³ He strongly fortifies his opinion with an excellent etymology based on the comparative study of Indo-European philology, and emphasizes Persian *tuman* and Slavic *tūma*. It should be added that Tokharian A *tmām* phonetically is on the same level as Russian *tma* (тьма or тма), which appears as early as the time of the Slavic-Church language and Old Russian. There are, further, the following derivatives: *t'mnik* (темникъ) and *tmo-načalnik* (тмоначальникъ), "commander of ten thousand;" *t'moyi* (тьмовый), "relative to ten thousand;" *tmoritseyu* (тморницею) and *tmorično* (тморично), "many times, incessantly;" *tmoričnyi* (тморичный), *tmotmušci* (тмотмушій), and *tmo-t'omniyi* (тмотёмный), "innumerable."⁴ This fact bears out the close relationship of Tokharian to Slavic insisted upon by M. MEILLET, and positively uproots the idea that the Tokharian and Slavic words have been borrowed from Turkish. The word (this fact is now well assured) is of Indo-European origin; and the Turkish word owes its existence to an Indo-European language, not *vice versa*. It should certainly be borne in mind that *tuman* belongs to the medial, not the ancient, stage of Indo-European speech-development (in regard to Tokharian M. MEILLET observes, "C'est une langue de type indo-européen moyen, et non pas du type ancien"), and that the documentary evidence thus far available

¹ Compare, as regards this particular case, the above Chinese transcriptions *t'u-mien* and *t'u-man*.

² *Les noms de nombre en Tokharien B (Mémoires de la Société de linguistique de Paris, Vol. XVII, 1912, pp. 281—294).*

³ *L. c.*, pp. 292, 293; and *Le Tokharien (Indogerman. Jahrbuch, Vol. I, p. 19).*

⁴ VLADIMIR DAL, Толковый словарь живого великорусского языка, Vol. IV, col. 767, 773, 887. The Russian word was formerly derived from Turkish by H. YULE (*Новоиз-Ловлон*, p. 929), and recently by ГОМБОЦ (*l. c.*). Yule pointed to Herberstein, who about 1559 reported that "one thousand in the language of the people is called *tissutse* (тысяча): likewise ten thousand in a single word *tma*."

strictly points to mediæval times.¹ In view of Avestan *baēvar*, Pahlavī and Persian *bēvar* ("ten thousand"), it would be interesting to have some more exact chronological indications as to the time when *tuman* springs up in Persian literature.

While I perfectly concur with M. Meillet in regarding *tuman* and its congeners as Indo-European, I venture to dissent from him in the opinion that the Turkish forms are derived from Tokharian: I am rather disposed to think that they hail straight from Persian. Phonetically, the Turkish, Mongol, and Tungusian forms are decidedly based on Persian *tumān* or *tomān*, while none of those languages exhibits a final *e* like Tokharian B *tumane*, and still less a contracted form like Tokharian B *tmāne* or Tokharian A *tmām*. There is, however, a still more weighty, culture-historical reason why the word in the languages of inner Asia should be traced to Persia as its home. The scholars hitherto engaged in the discussion of this question argued it only from the philological point of view, without accounting for the reasons of the wide expansion of the word, embracing the territory from the Baltic, the Danube, and the Black Sea as far as the north-eastern Pacific. The matter is concerned with the military history of Asia. It was not the necessity of having a word for the numeral "ten thousand," or of expressing the notion of a high indefinite number, that induced Turkish, Mongol, and Tungusian tribes to adopt the word *tuman*: it reached them in consequence of the reception, on their part, of the military organization and tactics launched in Persia. On another occasion I have explained the far-reaching influences emanating from Persia along this life, and the word *tuman* belongs to the same class. STEINGASS says, in his revised edition of Johnson's and Richardson's *Persian Dictionary*, that *tumān* refers to "districts into which a kingdom is divided, each being supposed to furnish ten thousand fighting men;"² that *tumān-dār* توماندار is the commander of a *tumān*, and *tumān-dārī* the command of a *tumān*. The same is expressed by RADLOFF in his *Turkish Dictionary* in assigning to Djagatai *tūmān* the significance "military unit of ten thousand men." As regards the Mongols, we all have read our Marco Polo, who describes the decimal system on which the Mongol army was organized, and who says that "they call the corps of a hundred

¹ For this reason I should hesitate to identify the name of the Hiung-nu Khan T'ou-man 頭曼, who died in 209 B. C., with Turkish *tuman* ("ten thousand"), as has been suggested by E. BLOCHET (*Les inscriptions turques de l'Orkhon*, p. 7, note 3). The Chinese transcription *t'ou-man* may well correspond to a Turkish *tuman*; but the latter, after all, may have had another meaning.

² The same definition is given under *toman* by G. TEMPLE, in his *Glossary of Indian Terms*, p. 262 (London, 1897). It was the Moghul emperors who with their army organization transplanted the matter and the term into India.

thousand men a *tuc*, and that of ten thousand a *toman*" (ed. of YULE and CORDIER, Vol. I, p. 261).¹ Yule certainly is on the right track when he annotates that the decimal army-division made by Chinggis at an early period of his career was probably much older than his time, and that in fact we find the Myriarch and Chiliarch already in the Persian armies of Darius Hystaspes. According to HERODOTUS (VII, 81), the Persian army invading Greece under Xerxes was divided into tens, hundreds, thousands, and ten thousands, each of these divisions having its own leader, and the leaders being placed under the command of the Myriarch. Again, an exceptional position was taken by the Immortals those picked Ten Thousand, who were all Persians, and were led by Hydarnes. When one of this corps died, his place was forthwith filled by another man, so that their number was never greater or less than ten thousand (VII, 83). At the root the matter was deeply associated with the territorial organization of the Old-Persian monarchy and the military conscription based thereon. Here we face truly Iranian institutions; and it is self-evident that these, together with many others, were absorbed by the Turks of inner Asia, and subsequently by the imitators of the latter, the Mongols. Hence we are driven to the conclusion that the word *tuman*, as the name of a very ancient Iranian military institution, was handed on to Turks and Mongols by the Persians: it was not mathematical, but military necessity that forced this word on its route of migration and tended to preserve its life.

There are, accordingly, good philological and historical reasons for determining the position of the word *tuman* with a fair degree of exactness. It is Indo-European in its origin, and propagated in Tokharian, Persian, and Slavic. It is a Persian loan-word in Old-Turkish; a Turkish loan-word in Magyar, on the one hand, and in Mongol, on the other hand; and a Mongol loan-word in Niüchi, Manchu, and other Tungusian languages. It has nothing to do with Chinese *wan*. On the contrary, wherever our word occurs in Chinese records, it is assuredly modelled after the Turkish-Mongol equivalent. T. WATTENS² has already made this correct observation: "The word *tuman* in Turki means a myriad, but it has other meanings also, and it is found in other languages. Certain Chinese writers seem to have adopted it, and the word occurs frequently in their writings. It is found transcribed in several different ways [see above], and it is generally used in the sense of a myriad." B. LAUFER.

¹ In like manner Ibn Baṭūṭa says that each squadron of the Khau was composed of ten thousand men, the chief of whom is styled *emīr tūmān* امیر طومان (ed. of DRAKEMER and SANGUINETTI, Vol. IV, p. 300). The military division of the Mongols into *tūmān* appears also from the chronicle of Sanai Setaen (I. J. SCHMIDT'S edition, pp. 175, 193, etc., 403); *tūmān*, of course, must not be conceived, with Schmidt, as a collective name of the Mongols.

² *Essays on the Chinese Language*, pp. 159, 160.

MÉLANGES.

SE-TIAO.

In speaking of the country Se-tiao (*T'oung Pao*, 1915, pp. 351, 373) I had overlooked the fact that M. CHAVANNES had drawn attention to this locality with reference to an interesting text of the *Lo yang kia lan ki* (*Journal asiatique*, 1903, nov.-déc., p. 531), adding that the information given by the çramaṇa P'u-t'i-pa-t'o 菩提拔陁 (Bodhibhadra) in regard to this country would merit a special examination. Bodhibhadra, after reaching the capital Lo-yang in 509, was interviewed by the Buddhist clergy of this place as to the customs of the southern countries and stated, "Formerly there was the country Nu-tiao, where four-wheeled carts drawn by horses were employed as means of conveyance. The country Se-tiao produces asbestine cloth made from the bark of a tree; this tree when exposed to a fire will not be consumed" (古有奴調國乘四輪馬爲車。斯調國出火浣布以樹皮爲之。其樹入火不燃。 *Lo yang kia lan ki*, Ch. 4, p. 15 b, ed. of *Han Wei ts'ung shu*). This is the passage to which I incidentally referred on p. 353, unfortunately relying on the *T'u shu tsi ch'êng*, which has the wrong reading 車斯國 (my remark on this alleged country Kū-se in note 4 must accordingly be discarded).

I avail myself of this opportunity to make a small addition to the notice regarding the animal *ki-ku* (p. 342). The text of the *Sung chi* is in the main derived from the older work *Yu yang tsa tsu* (Ch. 16, p. 15, ed. of *Pai hai*), where it is said: 獵得者斫刺不傷積薪焚之不死、乃大杖擊之骨碎乃死。 The animal *fêng li* (p. 343), however, is not given as a synonyme of *ki-ku* in this work, as wrongly stated in the *Pèn ts'ao kang mu*, but is treated there as a separate subject (Ch. 15, p. 8 b). See also *T'ai p'ing huan yū ki*, Ch. 177, p. 8 b.

B. LAUFER.

ARABIC AND CHINESE TRADE IN WALRUS AND NARWHAL IVORY

BY

BERTHOLD LAUFER.



EILHARD WIEDEMANN, the well-known physicist and Arabist at the University of Erlangen, published two years ago a paper on the value of precious stones among the Moslems¹⁾ which contains a great deal of material interesting to a student engaged in Chinese research. The bulk of these notes is based on a mineralogical work written by al-Bērūnī (973—1048), the eighth section of which contains the following on a product called *al-chutuw*²⁾: “It originates from an animal; it is much in demand, and preserved in the treasuries among the Chinese who assert that it is a desirable article because the approach of poison causes it to exude. It is said to be the bone from the forehead of a bull. Its best quality is the one passing from yellow into green; next comes one like camphor, then the white one, then one colored like the sun, then one passing into dark-gray. If it is curved, its value is a hundred dīnār at a weight of one hundred drams; then it sinks as low as one dīnār, regardless of weight”. At the end of another treatise dealing with the volumes of metals

1) Über den Wert von Edelsteinen bei den Muslimen. *Der Islam*, Vol. II, 1911 pp. 345—353.

2) *L. c.*, p. 353.

and precious stones, al-Bērūnī expands on the fashions to which the latter are subjected, and speaks again on the *chutw*: "It is asserted that it is the frontal bone of a bull living in the country of the Kirgiz who, it is known, belong to the northern Turks. The preference (for the one or other gem) changes with different social strata and peoples. The Bulgar bring from the northern sea teeth (*nāb*) of a fish over a cubit long. White knife-hafts (*nisāb*) are sawed out of them for the cutlers. The middle portion (of the tooth) is distributed among the single hafts, so that every piece of the tooth has a share in them; it can be seen that they are made from the tooth itself, and not from ivory, or from the chips of its edges. The various designs displayed by it give the appearance of wriggling. Some of our countrymen bring it to Mekka where the people regard it as white *chutw*. The Egyptians crave it and purchase it for a price equal to two hundred times its value. Likewise (as in the case of the teeth mentioned before) I conclude from the appearance of the *chutw* that it is the main portion of a tooth or horn. If it were really found among the Kirgiz, it would have certainly not been imported from the 'Irāq into a country nearer to this tribe". In a footnote Prof. WIEDEMANN remarks: "The significance of *al-chutw* is not clear. Perhaps mammoth-teeth are understood. A passage in al-Afkanī's dissertation on precious stones regarding this material runs thus: *Chartūt* is called also *chutw*. Abū'l Raiḥān al-Bērūnī says: it originates from an animal. It is said to be obtained from the forehead of a bull in the regions of the Turks in the country of the Kirgiz, and it is said also (by others than al-Bērūnī) that it originates from the forehead of a large bird which falls on some of these islands; it is a favorite with the Turks and with the Chinese. Its value comes from the saying that the approach of poisoned food causes it to exude. The Ichwān al-Rāzījāns state that the best is curved, and that it changes from yellow into

red, then comes the apricot-colored one, then that passing into a dust-color and down to black (*kahūba*). Formerly there were pieces whose price amounted to from one hundred to one hundred and fifty dinār. It has been established by experience that together with the vapors of perfume it has an excellent effect in the case of hemorrhoids”.

At the end of Wiedemann's paper G. JACOB¹⁾ imparts information on the subject from a Turkish work on mineralogy written in 917 (1511/12 A.D.) by Jahjā Ibn Muḥammad al Gaffārī, who makes the following statement: “On the Hutū Tooth. The *hutū* is an animal like an ox which occurs among the Berber and is found also in Turkistan. A gem is obtained from it; some say it is its tooth, others, it is its horn. The color is yellow, and the yellow inclines toward red, and designs are displayed in it as in damaskeening. When the *hutū* is young, its tooth is good, fresh, and firm; when it has grown older, its tooth also is dark-colored and soft. The padishahs purchase it at a high rate. Likewise in China, in the Magrib, and in other countries it is known and famous. It is told that a merchant from Egypt brought to Mekka a piece and a half of this tooth and sold it on the market of Minā for a thousand gold pieces. Poison has no effect upon one who carries this tooth with him, and poison placed near it will cause it to exude. For this reason it is highly esteemed”. G. JACOB²⁾ has the further merit of pointing to BRETSCHNEIDER's Mediaeval Researches (Vol. I, p. 153) where it is said in Ch'ang Tê's travels: “The *gu-du-si* is the horn of a large serpent. It has the property of neutralizing poison”. He further refers to URSU (Die auswärtige Politik des Peter Rares, p. 28) who says that in 1527 envoys from Moldau demanded passage from Poland to Moscow *pro comparandis*

1) *L. c.*, p. 357.

2) *Der Islam*, Vol. III, 1912, p. 185.

sobellis et aliis pellibus et similiter dentibus (piscium)¹⁾, quibus indiget ad solvendum tributum Turco.

The oldest Chinese source referred to in the *P'ei wên yün fu* as containing an allusion to *ku-tu-si* is the *Sung mo ki wên* 松漠紀聞 "Historical Memoranda regarding the Kin Dynasty", written by Hung Hao 洪皓 (1090—1155 A.D.) who was sent on an embassy to the Kin where he remained for fifteen years (1129—1143)²⁾. His statement runs as follows: "The *ku-tu-si* is not very large. It is veined like ivory, and of yellow color. It is made into sword-hilts (or knife-handles). It is a priceless jewel"³⁾.

The report of Hung Hao led me to think that the word *ku-tu-si* might be derived from a Tungusic language, either from that of the Niüchi or the Klitan. Accordingly, I made a search through Ch. 116 of the *Liao shi*, in which the words of the Khitan language are explained, and found (p. 17 a): "*ku-tu-si*: the horn of a thousand years' old snake; there is also the word *tu-na-si*" 楛柎犀、千歲蛇角、又爲篤納犀。⁴⁾ To make sure that these trans-

1) It will be seen farther on from a consideration of Russian sources that these 'fish-teeth' were walrus-tusks.

2) A. WYLIE, *Notes on Chinese Literature*, p. 32, who adds: "During his residence in the neighborhood of their capital, he had jotted down a large collection of notes, but these were committed to the flames by the authorities, when he was about to return to his country. The present work consists of a portion of his more extensive manuscript, written from memory after his return, and is of value as a record of the time". The work is reprinted in the collection *Ku kin yi shi*. The life of the author is described by MAYERS (*Chinese Reader's Manual*, p. 64) and GILES (*Biographical Dictionary*, p. 344); compare also CHAVANNES, *Voyageurs chinois chez les Khitan et les Joutchen (Journal asiatique, Mai-Juin, 1898, p. 370)*.

3) 骨咄犀不甚大、紋如象牙、帶黃色、作刀靶者已爲無價之寶也。Quoted in *P'ei wên yün fu*, Ch. 8, p. 89 b; in the same way in *Pên ts'ao kang mu* (Ch. 43, p. 13 b) except that the word *si* 犀 is added after *ku-tu-si*, meaning "the horn of the *ku-tu-si*".

4) PALLADIUS, in his *Chinese-Russian Dictionary* (Vol. I, p. 504) has entered the word *ku-tu-si* (but adopting the orthography of the *Cho keng lu* 骨咄犀) with the meaning "horn of a snake, extraordinarily poisonous, but notwithstanding effectual against poisons". As will be seen below, this definition is based on the *Cho keng lu*. Palladius is the only one of our dictionaries to take notice of the word *ku-tu-si*.

criptions had not been tampered with by the K'ien-lung editors, as it is well known has been done in the case of the *Yüan shi*, I looked up the passage in an edition of the *Liao shi* printed in 1529 where it occurs (p. 24) with exactly the same wording and written with the same characters; the date "eighth year of the period Kia-tsing" is imprinted on the margin of this very page. We may therefore be sure of the fact that this passage and the mode of writing the word *ku-tu-si* were contained in the original edition of the *Liao shi* and are peculiar to the Khitan period. This brief text consisting of only twelve words is very valuable: it shows that the product was known in the period of the Liao (907—1125), the beginning of which is coeval with the lifetime of al-Bērūnī, apparently the first Arabic author who had a knowledge of the same product; it further gives a definition of it, which, though fanciful, will assist us in recognizing its character, and two appellations of the product, both of which are clearly characterized as words of the Khitan language¹). The second of these words *tu-na-si* does not seem to occur in any later source.

The glossary of the *Liao shi* is not intended to embrace an

1) In the *Sui shi kuang ki* 歲時廣記 by Ch'ên Yüan-tsing 陳元靚 of the Sung period (Ch. 40, p. 11; edited by Lu Sin-yüan in his *Shi wan kuan lou ts'ung shu*; see PELLIOR, *B.E.F.E.O.*, Vol. IX, 1909, p. 224) occurs the word *ku-tu* 骨髓.

The character 髓 (not in Giles) is read *k'w* in the tribal name *Yüe* (月)-*k'w*, but otherwise *tu* 咄 (according to *Tsi yüan*), and according to the *Yü p'ien* of 543 means 'divination from the voices of birds' (鳥鳴豫知吉凶). It is the question of the customs observed on the last night of the old year (歲除), and one of these consists in burning *ku-tu* to illumine the hall, and to strengthen the male principle (i. e. to ward off demons, calamities, diseases etc.). The essential condition of this observance is the bright, open fire which may be effected also by torches and the pods of *Gleditschia sinensis* (*tsao kio* 皂角), and there can hardly be any doubt that the above *ku-tu* represents likewise a combustible substance of vegetable origin (not listed in BRÜTSCHNEIDER'S *Botanicon Sinicum*), and has therefore no relation whatever to the *ku-tu-si* of the Liao and Kin periods.

exhaustive list of Khitan words, but it is its purpose merely to explain such Khitan words as masqueraded in a Chinese garb appear scattered through the Annals. They are consequently arranged in the sequence of the chapters in which they occur. The word *ku-tu-si* is placed under the heading "Biographies" 列傳, so that it is bound to have been used in this section of the Annals. There is an instance of the application of the word in Ch. 96, p. 3 b, where it is written in the manner as above indicated and mentioned as a gift together with jade; but no inference as to the nature of the product can be drawn from this passage¹).

There are three references to *ku-tu-si* in the Mongol period. But these pertain to the Mohammedan countries of the west, while the *Kin* author distinctly describes a product in the far north of China. The one is indicated by BRETSCHNEIDER²) in the *Si shi ki* 西使記 edited by Liu Yü, containing the diary of Ch'ang Tê 常德 who was dispatched by the Mongol Emperor Mangu in 1259 as an envoy to his brother Hulagu, king of Persia. He mentions among the products by the western countries *ku-tu-si* 骨篤犀 as the horn of a large snake which has the property of neutralizing every poison. It is curious that the *Pên ts'ao kang mu* of Li Shi-chên (Ch. 43, p. 13 b) quotes the same passage (the work is called *Shi Si-yü ki* 使西域記 by Liu Yü 劉郁) to the effect that "the *ku-tu*(篤)-*si* is the horn of a large snake produced in *Si-fan* 西番"³).

1) Others better read in the *Liao shi* or having more time for reading will probably be able to reveal more passages of this kind. It may be presumed that the word will be found also in the *Kin shi*.

2) *Chinese Recorder*, Vol. VI, 1875, p. 19, or *Mediaeval Researches*, Vol. I, p. 153.

3) In the first edition of his translation of the work which appeared in the *Chinese Recorder* (Vol. VI, p. 19) BRETSCHNEIDER said that the statement of the *Si shi ki* has passed into the *Pên ts'ao kang mu*; in *Mediaeval Researches* (Vol. I, p. 153), this reference is omitted. It is strange that Bretschneider, who had doubtless perused this section of the *Pên ts'ao*, omits to call attention to the fact that *Si-fan* is there given as the place of

Tao Tsung-i 陶宗儀, the author of the interesting work *Cho keng lu* 輟耕錄, published in 1366, has devoted a brief notice to this subject. The edition referred to is that printed in 1469 (Ch'êng-hua period) which is liable to afford a guarantee for

production. Nevertheless it may be that in the editions of the work consulted by Bretschneider the word *Si-fan* does not occur. He states (p. 110) that many typographical blunders have crept into the different editions, which render it difficult for the reader to understand who has access only to one edition, and that he has compared the texts of four different editions so as to be enabled to reconstruct the complete original. This variant, at all events, should have been noted, for a traditional opinion seems to exist among the Chinese that *ku-tu-si* is also a product of Tibet. This view is expressed in the *Wei Ts'ang t'u chi* 衛藏圖識 (Ch. 下, p. 22 b, in the original edition of 1792, where *ku-tu-si* 骨篤犀 is enumerated in a list of the strange products 異產 of Tibet and described as "pale blue-green, and when struck, emitting a clear sound like jade; it is scented and can overcome all poisons". This passage inclusive of the other *mirabilia* mentioned is quoted from a work *Yi shi* 譯史 (not to be confounded with the *Yi shi* 釋史 by Ma Su of 1670 in 48 vols.), a curious small book written in four chapters by Lu Ts'e-yün 陸次雲 (T. Yün-shi 雲士) full of marvelous notes regarding real and imaginary countries. WYLIE (Notes, p. 64) mentions the work under the fuller title *Pa hung yi shi*, and adequately describes its contents (a copy of it is in my library). According to WYLIE (Notes, p. 60), the author who wrote also a miscellany concerning the antiquities on West Lake near Hang-chou lived in the middle of the seventeenth century. It hence follows that the two officials Ma Shao-yün and Shêng Mei-k'i, the authors of the *Wei Ts'ang t'u chi* (see WYLIE, Notes, p. 64, and ROCKHILL, *J. R. A. S.*, N. S., Vol. XXIII, pp. 23—26), do not speak of the subject on the ground of a personal experience but of mere bookish knowledge, nor do they assert that they actually encountered the product in Tibet. The *Yi chi* on which they depend is a pure story-book of the wondrous kind, devoid of historical value. Moreover it will be noticed from the text of the *Ko ku yao lun* of the Ming period, given farther on, that the statement of the *Yi shi* is a literal extract modeled after the latter work, and therefore forfeits any claim to consideration as an independent observation; the *Ko ku yao lun*, in its notice on *ku-tu-si*, makes no allusion to Tibet. The author of the *Yi shi*, consequently, links two literary reminiscences into one by combining the text of the *Ko ku yao lun* with the supposed reading *Si-fan* in one of the editions of the *Pen ts'ao kang mu*. His makeshift, not sustained by any palpable evidence, cannot therefore be considered as a contribution to the eventual question as to whether *ku-tu-si* may have existed in Tibet, and which to all appearances will shrink into the clerical error of a copyist. The fancy of the *Yi shi* is copied again in a recent work on Tibet, *Si-ts'ang t'u k'ao* 西藏圖考, by Huang P'ei-k'iao 黃沛翹 of Hu-nan (first published in 1886, reprinted in the geographical collection *Huang ch'ao fan shu yü ts'ung shu*, 1903, vols. 1—2; Ch. 6, p. 27 b). Here again it is merely a case of reproduction without the evidence of a personal experience.

representing the text of the original issue. The passage (Ch. 29, p. 7 b) runs as follows: "*Ku-tu-si* is the horn of a large snake, and as it is poisonous by nature, it can counteract all poisons, for poison is treated with poison. For this reason it is called *ku-tu-si* ("ku-poison horn")¹⁾. In the Annals of the T'ang dynasty it is the question of the country of *Ku-tu* 古都, so that it seems that this place is responsible for this product. It is therefore erroneously that the people of the present time write the word *ku-tu* 骨咄"²⁾.

1) The conception that *ku-tu-si* cures *ku-tu* rests on a notion of sympathetic magic elicited by a pun upon the words. The substitution of the word *ku*, it seems to me, has been suggested by the passage regarding rhinoceros-horn in the *Shên-nung pén ts'ao king* (Ch. 2, p. 31 a; edition of *Chou-shi hui k'o I hio ts'ung shu*, 1891) where it is said: "The taste of rhinoceros-horn is bitter and cold; it cures all poisons and the *ku* poison"

犀角味苦寒主百毒蠱。The nature of the *ku* poison is discussed at some length by S. WILLIAMS (Witchcraft in the Chinese Penal Code, *J. China Branch R. A. S.*, Vol. 38, 1907. pp. 71—74); it has been made the subject of a monograph on the part of A. PFIZMAIER under the somewhat startling title *Das Ereignis des Wurmfrasses der Beschwörer* (*Sitzungsberichte der Wiener Akademie*, 1862, pp. 50—104), which despite the questionable correctness of the translations makes interesting reading. In my opinion the numerous intestinal parasitic worms causing many diseases in China (now fully discussed in the remarkable work by Dr. JAMES L. MAXWELL, *The Diseases of China*, p. 137, London, 1910) form the basic foundation of the *ku* poison, with a later development into an alleged practice of witchcraft; but it seems very doubtful if *ku* has ever the meaning of insanity attributed to it by Giles. Cases of insanity are rare in China, as may be seen from MAXWELL, p. 256. The flesh of the fox which was eaten by the ancient Chinese was formerly considered as a preventive remedy against *ku* poison (SCHLEGEL, *Uranographie chinoise*, p. 167).

2) 骨咄犀大蛇之角也、其性至毒解諸毒、蓋以毒攻毒也、故曰蠱毒犀、唐書有古都國必其地所產、今人訛爲骨咄耳。 *P'ei wén yün fu* (Ch. 8, p. 89 b) gives only the first clause with the variant 解蠱毒如犀角 "it counteracts the *ku* poison like rhinoceros-horn", which is evidently derived from a different edition of the *Cho keng lu*. This phrase occurs also in the quotation from this work as given in *Pén ts'ao kang mu* (Ch. 43, p. 13 b) under the heading "snake-horn". The last clause is cited there in a different way: 唐書有古都國亦產此則骨咄又似古都之訛也。 This seems to mean: "The T'ang *shu* mentions the country of *Ku-tu* as producing this (horn), so that the word *ku-tu* 骨咄

T'ao Tsung-i, evidently, does not speak from any personal experience with the object which he is discussing, but reflects and philosophizes on it. The definition of the *ku-tu-si* as a snake-horn, is derived, apparently, from Ch'ang Tê, while in the writing of the name with the character *tu* 咄¹⁾ the tradition of the Kin period inaugurated by Hung Hao is retained. The opinion that the object in question is poisonous and therefore cures poison is peculiar to the author; it is by no means, however, his original idea, but one transferred from the ancient beliefs in the properties of rhinoceros-horn to the *ku-tu-si*. The Taoist adept and writer Ko Hung who lived in the first part of the fourth century A.D. is the father of the theory that the rhinoceros feeding on brambles devours all sorts of vegetable poisons affecting the horn which, according to the principle that poison cures poison, becomes an efficient antidote²⁾.

A country *Ku-tu* 古都 is not known to me; but *T'ang shu*, Ch. 221, contains a notice of the country *Ku-tu* 骨咄 identified

seems to be erroneous for *ku-tu* 古都". — Another way of writing is introduced into a work entitled *Liang ch'ao chai yü* 兩鈔摘腴 (quoted in *P'ei wên yün fu*, Ch. 92, p. 18 b) where it is said: "What is now called *ku-tu-si* 骨咄犀 is the horn of a snake; being poisonous by nature, it is capable of neutralizing poisons, and is therefore called *ku tu si* 蠱毒犀". The date of this work is not known to me; but the definition being identical with that of the *Cho keng lu*, it may be concluded that it is posterior to the latter book.

1) The *P'ei wên yün fu* regards this as the standard mode of writing. The transcription 篤 occurs again in the *Ko ku yao lun* (see farther on).

2) *Pên ts'ao kang mu*, Ch. 51 上, p. 6. I do not enter here into a discussion of the rhinoceros and its horn, as I have just completed a lengthy investigation of this subject which it is hoped will be embodied in a publication to come out in the near future. The contention of Prof. GILES (*Adversaria Sinica*, p. 394) that the words *se* 兕 and *si* 犀 originally refer to a bovine animal is not at all justified, and none of the arguments advanced by him in favor of this point of view can be defended. All available evidence philological, historical, archaeological, zoological and palaeontological leads me to the result that the words *se* and *si* very well apply to the rhinoceros, and to this animal exclusively, and that from earliest times two distinct species are understood, the word *se* referring to the single-horned rhinoceros (*Rhinoceros unicornis*), and the word *si* to the two-horned rhinoceros (*Rhinoceros sumatrensis*).

by M. CHAVANNES¹⁾ with Khottal on the upper Oxus north-east of Tokharestan. There is evidently some confusion in the passage quoted, but however this may be, there is no connection between the product *ku-tu-si* and the country of *Ku-tu*, for the text of the *T'ang shu* as translated by M. CHAVANNES attributes to Khottal excellent horses, red leopards and black salt mined in four mountains, but not snake horn or any other horn. The combination of *ku-tu-si* and *Ku-tu* is therefore arbitrary and suggested only by their phonetic similarity. This confusion may be accounted for by "the snake-horn of Ku-tu" 古都之蛇角 mentioned in the *Shan hai king* and explained by a commentator as a designation for "the blue-green rhinoceros-horn" 碧犀²⁾. This seems to be also the reason why the *Ko ku yao lun* (see below) gives this definition for the *ku-tu-si*.

Nevertheless it is probable that the product in question was known in the age of the T'ang dynasty. At least the *K'in ting Man-chou yüan liu k'ao*³⁾ (lithographic reprint of 1904, Ch. 19, p. 15) quotes the following statement from the *T'ang hui yao*:⁴⁾ "In the country of the *Mo-ho*⁵⁾ there is a great number of sable-skins, *ku-tu* horn 骨咄角, white hares, and white falcons". The *T'ang hui yao* is not accessible to me, and I am not inclined to regard this passage as conclusive as to the occurrence of the word *ku-tu* in the T'ang period, unless more substantial evidence will be forthcoming. Yet it will be seen below that the product represented

1) *Documents sur les Toukius (Turcs) occidentaux*, p. 168 (and see Index).

2) Quoted in *P'ei wên yün fu*, Ch. 92, p. 18 b.

3) WYLIE, *Notes on Chinese Literature*, p. 44. The work was published in 1778 (not 1777) by order of the Emperor K'ien-lung.

4) A work relating to state matters of the T'ang dynasty compiled by Wang P'u of the tenth century (WYLIE, p. 69).

5) The *Mo-ho* were settled in the north of Korea and extended east of the Sungari to the ocean; the Shi-wei were their neighbors in the north, the T'u-küe in the west (*Kiu T'ang shu*, Ch. 199 下, p. 7 b).

by the word *ku-tu* or *ku-tu-si* was known in that epoch, but under a different name ¹).

Finally there is a brief reference in the *Yüan shi lei pien* (Ch. 42, p. 53 a; edition of 1795) ²) to the effect that "*ku-tu*(**篤**)-*si* is originally the horn of a large snake and is capable of neutralizing all poisons". It is listed there among the products of Central Asia (*Si yü*). The passage has no independent value and is doubtless copied from the account of Ch'ang Tê.

A work of the Ming period, the *Ko ku yao lun* **格古要論**, a collection of essays in thirteen chapters on objects of art and antiquities by Ts'ao Chao **曹昭**, published in 1387 (revised and enlarged edition by Wang Tso **王佐** in 1459) ³) makes the following allusion to this subject: "*Ku-tu-si* is a blue-green rhinoceros-horn; it is in color like a pale blue-green jade and is also yellow to a small extent. Its veins resemble those of a horn; when struck, it emits a clear sound, much more so than jade. When you [rub or scrape and] smell it, you will find it is scented; but when burnt, it is odorless. It is very highly prized, for it can reduce swellings and neutralize poison" ⁴).

1) The great historical importance of this passage will be discussed below in our attempt to identify this product.

2) In *Skizze der mongolischen Literatur* (Keleti Szemle, 1907, p. 213) the name of the author, on the authority of Bretschneider, had been given by me as *Kiai-shan*. PAUL PEUJOT, with obliging courtesy, has been good enough to inform me that *Kiai-shan* **戒山** is only his *hao*, and that his real name is Chao Yüan-p'ing **邵遠平**. The passage of the *Yüan shi lei pien* is not quoted in *P'ei wên yüan fu*.

3) BRETSCHNEIDER, *Botanicon Sinicum*, pt. I, p. 162; HIRTH, *Ancient Chinese Porcelain*, p. 141; BUSHELL, *Description of Chinese Pottery and Porcelain*, p. 175.

4) **骨篤犀碧犀也、色如淡碧玉稍有黃色、文[理]似角、扣之聲清越如玉、[磨刮]嗅之有香、燒之不臭、最貴重能消腫[解]毒。** *P'ei wên yüan fu* (Ch. 8, p. 89 b) and *Pên ts'ao lun, mu* (Ch. 43, p. 13 b). The characters enclosed in brackets are additions occurring only in the latter work.

Li Shi-chên, the author of the *Pên ts'ao kang mu*¹⁾, has devoted a full discussion to the *ku-tu-si* (Ch. 43, p. 13 b; edition of *Tsi ch'êng t'u shu*, Shanghai, 1908, reprint of the edition of 1657). He takes note of the two different ways of writing the word and records also the name *pi si* "blue-green rhinoceros-horn" due to the *Ko ku yao lun*. Nevertheless he does not entertain this explanation seriously, for the subject is treated under the heading "snake-horn"

1) The literary history of this work, completed after 26 years' labor in 1573 and first printed in 1596, has been traced by BRETSCHNEIDER (*Bot. Sin.*, pt. 1, p. 55), who states that the earliest edition now extant seems to be that of the year 1658. But there are older ones in existence. HIRTH (*J. China Branch R. A. S.*, Vol. XXI, 1886, p. 324) refers to a Ming print of 1603, possibly the second edition published. An edition of 1645 in 16 vols., edited by Ni Shun-yü 倪純宇 of Hang-chou, was secured by me in Tokyô and is now deposited in the John Crerar Library of Chicago, which, besides, has an edition of 1826 in 39 vols., and one issued in 1885 in 40 vols., the best modern reprint. The text of the Shun-chi editions is more accurate than that of the K'ien-lung and Tao-kuang editions. Despite diligent search and many efforts I failed to discover in China the *editio princeps* which seems to be entirely lost, and not to exist any longer in any Chinese library; positively I may say it exists in no private library of Si-ngan fu. The recent reprints are based on the Shun-chi issues. Also Mo Yu-chi 莫友芝, the author of the excellent bibliographical work *Lü t'ing chi kien ch'uan pén shu mu* (Ch. 8, p. 11; compare the notice of CHAVANNES, *T'oung Pao*, 1910, p. 146) does not know any earlier edition than that of 1603; he further enumerates re-editions of 1640, of the period Shun-chi (1644—61), of 1684, and 1736. The value of the *Pên ts'ao kang mu* is vitiated by occasional carelessness and defectiveness with which extracts from previous works are quoted, and in important cases it is not safe to rely exclusively upon its text; this feature must have adhered to the original edition, while the misprints of the later editions, of which Bretschneider complains, may be overcome. For a revision of the text, good services are rendered by the *Chêng lei pén ts'ao* (on which a bibliographical notice is given farther on), as will be seen from the chapter on the rhinoceros where the whole text of the *Kang mu* has been restored and supplemented by me on the basis of the *Chêng lei*. It is further necessary to resort to the *Pên ts'ao kang mu shi*: 本艸綱目拾遺 written by Chao Hio-min 趙學敏 of Hang-chou in 1650, reprinted in 1765. This important work, not made use of by Bretschneider, to which I called attention in the Publication of the *Congrès international des Américanistes à Québec*, Vol. I, 1907, p. 260, in connection with a study of the introduction of maize, ground-nut and other cultivated American plants into Asia, contains in the first chapter a long list of rectifications of Li Shi-chên's errors 正誤, while the nine remaining chapters embrace a most valuable supplement and are chiefly taken up with interesting notes regarding the newly introduced plants and products of the sixteenth and seventeenth centuries.

蛇角 which is arranged in the section on snakes, while it is not dealt with at all in the essay on the rhinoceros and rhinoceros-horn (Ch. 51 A, pp. 5 a *et seq.*) where the word *ku-tu-si* is not even mentioned. It is thus perfectly evident from the texts of the *Liao*, *Kin* and *Yüan* periods as well as from the view taken by Li Shi-chên in the matter that rhinoceros-horn and *ku-tu-si* are entirely distinct substances in Chinese eyes. It could hardly be expected to be otherwise, as the Chinese were thoroughly familiar with the rhinoceros-horn ages before the *ku-tu-si* entered upon their horizon, and have woven many wondrous legends around the former beginning with the Taoist adept Ko Hung of the fourth century.

Li Shi-chên quotes the *Cho keng lu* discussed above, and then makes reference to the *Ta Ming hui tien*, "the Statutes of the Ming Dynasty" ¹⁾ as saying that "snake-horn is produced in the district of Hami" ²⁾. But the name *ku-tu-si* is not mentioned here.

After quoting Ch'ang Tê, the *Ko ku yao lun* and *Sung mo ki wên*, Li Shi-chên arrives at the conclusion that *ku-tu-si* is poisonous and capable of reducing swellings and neutralizing all poisons as well as the *ku* poison, as poison is treated with poison. It is evident that he had a good literary knowledge of the subject and knew the principal sources relating to it, except the earliest passage in the

1) A copy of this work (edition of 1620) is in my possession, but I cannot find in it, after a cursory search, any allusion to the snake-horn of Hami; it would be difficult to guess in which chapter to look for this information. PAUL PELLLOT (*B.E.F.E.O.*, Vol. IX, 1909, p. 37) has given valuable notes on the literary history of this work. The *Ta Ming i t'ung chi* (edition of 1461, Ch. 89, fols. 19 a, 21 a) mentions a horn *yin ya kio* 陰牙角 as product of Hami and *Qarā-khodjo* 火州 (see PELLLOT, *Journal asiatique*, 1912, pp. 579—603), and a *su ho kio* 速霍角 as a product of the latter locality only. According to the geographical section of the *Tang shu* (quoted in *Pai wên yün fu*, Ch. 92, p. 26) both these products were sent as tribute (no date given) from *Pai t'ing* 北庭. I cannot explain these names which do not seem to occur elsewhere; even Palladius has not registered them; they are not listed in the Glossary of the *T'ang shu*.

2) 蛇角出哈密衛。

Liao shi. But the principal question to be raised is whether he had any personal experience with, or actual knowledge of the object, and this must be flatly denied. In this account no word of his own is uttered which would justify the conclusion that he had ever had a *ku-tu-si* before his eyes. This is in striking contrast with his notes on rhinoceros-horn which furnish ample proof that he had really seen and studied it. Of rhinoceros-horn he states expressly that it is not poisonous (and this is a fact corroborated by a scientific investigation made years ago in London), while in the above case he blindly accepts the purely imaginary assertion of T'ao Tsung-i.

The most recent author in whom I have been able to find the word *ku-tu-si* is Fang I-chi 方以智 in 1640¹), in his *Wu li siao shi* 物理小識 (edition of *Ning tsing t'ang*, 1884, Ch. 8, p. 20) who merely states that "*ku-tu-si* is a snake-horn of blue-green color", a sentence embodied in a notice on rhinoceros-horn and apparently the echo of former statements.

In attempting to identify the character of the product *ku-tu-si* it is apparent that the epigone, purely bookish utterances of the Ming authors are devoid of any practical value, and that the earliest accounts of the *Liao shi* and *Sung mo ki wén* must primarily be taken into consideration. Hung Hao, the author of the latter work, had evidently had the product under his eyes on the occasion of his visit to the Khitan country, and reports it in plain and sober language without a gleam of imagination. First of all it becomes evident from his definition that *ku-tu-si* is a kind of ivory, and that for this reason it is utterly impossible to assume that it is anything like rhinoceros-horn, which is most assuredly not "veined like ivory", as Hung Hao expressly states. The definition

1) HIRTH, *T'oung Pao*, Vol. VI, p. 428.

of the *Liao shi* "the horn of a thousand years' old snake", moreover, militates against such an hypothesis, for there would be in all the world no reason to designate a rhinoceros, or to confound it with, a snake, especially for a people like the Chinese who were acquainted with the single-horned and two-horned species of rhinoceros from the earliest days of antiquity. The *ku-tu-si* was a kind of ivory, but could have been neither elephant nor mammoth¹⁾ ivory, for this was always called and is still called *siang ya* 象牙, and the Chinese, in the epoch of the Khitan, were surely familiar enough with the elephant and the mammoth to be sufficiently sophisticated not to classify these animals with snakes²⁾. Besides the elephant

1) The mammoth has become known to the Chinese to a certain extent from the stories of Siberian natives, under the name *yin shu* 隱鼠 'the hidden rodent' (first mentioned by T'ao Hung-king), as the belief prevailed in Siberia that the mammoth lives and moves underground, shatters the banks of rivers, and dies as soon as it comes up to the surface (compare especially S. PATKANOV, *Die Irtysh-Ostjaken und ihre Volkspoesie*, Vol. I, pp. 123—124, St. Pet., 1897). Li Shi-chên has gathered the principal notes on the subject in his *Pên ts'ao kang mu* (Ch. 51 下, p. 10). Klaproth, I believe, was the first to resort to this work for information when he found mammoth-bones in the Chinese drug-stores at Kiachta and had the name of the animal pointed out to him in that book. F. W. MATERS treated the subject in *China Review*, Vol. VI, pp. 273—6, with an additional note in Vol. VII, p. 136; and J. EDKINS popularized it in a brief essay inserted in his "*Modern China*", p. 24 (Shanghai and London, 1891). The subject, though practically finished, would be capable of a more critical and exact treatment. The curious fact has strangely been overlooked that the older texts as quoted in the *Pên ts'ao* fail to allude to the mammoth as the animal furnishing the fossil ivory of Siberia, nor is any reference at all to the tusks, and the Chinese seem not to have been aware of this fact, until the attention of the Emperor K'ang-hi was called to it by Russians presenting themselves at his court in 1721 (see MATERS, *l. c.*, p. 274). There is, as far as I know, no ancient Chinese reference to mammoth-ivory and its importation from Siberia, and the evidence for such a trade mainly rests on Russian-Siberian reports, one of the oldest of which is contained in the learned book of the Swedish Captain PH. J. v. STRAHLENBURG (*Das nord- und östliche Theil von Europa und Asia*, p. 393, Stockholm, 1730). It should be understood, of course, that the mammoth and its ivory tusks were known to the natives of Siberia ages before it came to the notice of our scientists.

2) There is also a logic of imagination, inherent even to the wildest fairy-tales. The building of a snow-hut in an equatorial region, the handling of a palmleaf fan near the North Pole, the assigning to an animal a rôle which in accordance with its natural qualification it could not represent would offend the imaginative faculties of a child's

and the mammoth there are only two other creatures on this globe furnishing ivory, and these are the narwhal and the walrus, and for this reason our first conclusion is that *ku-tu-si* is nothing but ivory obtained from walrus and narwhal¹). Ample historical evidence

susceptible mind and be immediately rejected. The former conception of whale, seal and walrus as fish was perfectly logical and compatible with the mental working of a primitive mind which first clings to some exterior trait in observing a new phenomenon and links with the new an old familiar experience; it thus arrives at a series of classifications or a system of associated notions widely differing from ours, and here is the germ of the fundamental diversity in the intellectual make-up of the various nations. The Chinese, in agreement with the peoples of Siberia, have affiliated the mammoth with the ox, the water-buffalo, the pig, the mole; all this is perfectly logical and consistent with their imaginative traits. Yet an association of the mammoth with a serpent has never entered their minds, and such a conception flatly contradictory to any law of the logic of imagination would be utterly impossible in any human society. On the other hand when referred to the narwhal and walrus, the simile with the snake becomes a logical transcript of what the emotional flight of primitive imagination has suddenly and swiftly perceived at the sight of a novel object.

1) In the zoological system the walrus belongs to the order Pinnipedia which consists of the three families *Otariidae* (eared seals), *Trichecidae* (walrus), and *Phocidae* (seals); the genus *Trichecus* consists of the two species *rosmarus* occurring on the coast of Labrador northward to the Arctic Ocean, along the shores of Greenland, and in the polar areas of the eastern hemisphere to western Asia, and *obesus* occurring on the north-west coast of America, in the Arctic Sea and Bering Strait as well as along the north-eastern coast of Asia. The most striking characteristic of the animal is the pair of tusks corresponding to the canine teeth of other mammals and descending almost directly downward from the upper jaw, sometimes attaining a length of twenty inches or more. Some information on the various names of the walrus is given farther on. — In the zoological system the narwhal belongs to the order *Cetacea*, family III *Delphinidae*, sub-family I *Delphinapterinae*, genus *Monodon*, species *monoceras*, or *monoceros*. The animal frequents the icy circumpolar seas, and is rarely seen south of 65° N. lat. It resembles the white whale in shape and in the lack of a dorsal fin. Its peculiar feature is the absence of all teeth, except two in the upper jaw arranged horizontally side by side. In the male, usually the left tooth, and occasionally both teeth, are strongly developed into spirally twisted straight tusks passing through the upper lip and projecting like horns in front. They often reach a length of half, and even more, that of the entire animal which in the state of maturity may attain to fifteen feet. Its life-history is unfortunately little explored, and the biological function of the tusk or tusks is more conjectured than accurately ascertained (weapon of defense, for breaking ice in order to breathe, and for killing fish). — “The ivory of the narwhal is esteemed superior to that of the elephant, and far surpasses it in all its qualities; it possesses extreme density and hardness, has a dazzling whiteness, which does not pass into yellow, and easily receives a very high polish” (W. JARDINE, *The Natural History of the*

will be furnished for the fact that an ancient trade in the ivory of these two arctic sea-mammals existed, in Russia at least from the ninth century, also that the Chinese received this article probably over two commercial routes and still obtained it in recent times at least as far down as the middle of last century, and presumably even at present, and further that the Japanese cultivated this product obtained by them in the channel of trade.

First, to return to our earliest definitions of *ku-tu-si*, — they most excellently fit the proposed identification, for it is the very designation of 'horn' under which narwhal and walrus ivory was at all times current all over the northern hemisphere, as may be learned from the pieces of evidence brought together in the footnote¹). The report that the narwhal was described as a snake is

Ordinary Cetacea or Whales, p. 190, Edinburgh, 1837). In regard to walrus ivory J. A. ALLEN (*History of North American Finnpeds*, p. 133, Washington, 1880) remarks: "The ivory afforded by the tusks, though inferior in quality to elephant ivory, is used for nearly the same purposes. It is said, however, to sooner become yellow by exposure, to be of coarser texture, and hence to have less commercial value".

1) The narwhal tusks were always designated "horn" in Europe, hence the term *monoceros* and the "unicorn of the sea", the name being even retained in our natural history. "The two tusks, long and pointed, are usually called horns", says Sir William Jardine (*The Natural History of the Ordinary Cetacea or Whales*, p. 182, Edinburgh, 1837). "The creature grows to a length of about fifteen feet; such an individual would have a 'horn' of some seven feet" (F. E. BEDDARD, *A Book of Whales*, p. 247, New York, 1900). ANSELMUS BOETIUS DE BOOT, court-physician to the Emperor Rudolf II (*Gemmarum et lapidum historia*, ed. A. TOLL, p. 434, Lugduni Batavorum, 1636; the first edition of this interesting work had appeared at Hanover in 1609) describes a walrus-tusk (*rosmari dens*) which he had seen at the end of the sixteenth century in the possession of a druggist at Venice (*simplicista rerum exoticarum studiosissimus*) and expressly states that during and before his time these tusks were confounded with, and sold in the place of, rhinoceros-horn, the basest substitute of which, however, was cervine antlers; all of these, according to the experience of many, were believed to have no small properties against poison (*cornu multorum experientia non exigua adversus venena habet vires*). — Also in the Eskimo story of the origin of the walrus and the caribou, according to which the walrus at first had the caribou's antlers, and the caribou the tusks of the walrus, till an exchange was effected by a woman magician, an idea of relationship between tusks and antlers seems to be at the root (compare BOAS, *The Eskimo of Baffin Land and Hudson Bay*, p. 167, *Bull. Am. Mus. Nat. Hist.*, Vol. XV, 1901). The Yakut indiscriminately designate mam-

perfectly believable and has nothing surprising for him who has studied the interesting story of the gradual development of our knowledge of narwhal and walrus which has become somewhat accurate only during the last decenniums, while it has been an unbroken chain of myth and fable ever since the days of Albertus Magnus and Olaus Magnus. The "thousand years' old snake" is nothing but the fossil narwhal occurring on the northern shores of Siberia, especially in the valley of Kolyma River, on which v. DITMAR and v. NORDENSKIÖLD (see footnote) have reported. Stress should be laid on the continuity of Chinese tradition: the snake-horn of the Liao period appears again persistently in the age of the Mougols and is finally endorsed by Li Shi-chên. There is

mooth and walrus ivory as *muos* 'horn' (PEKARSKI, *Short Russian Yakut-Vocabulary*, pp. 37, 108, Irkutsk, 1905). The mammoth tusk is regarded by the native tribes of Siberia as a horn, the Yukaghir word *solhutönmun* signifying 'the horn of the mammoth' (JOCHELSON, *Sketch of the Animal Industry and Fur Trade in the Kolyma District*, in Russian, p. 107, St. Pet., 1898). 'Horn' has thus developed in Siberia into a commercial term which may comprise mammoth, walrus, and narwhal tusks, and certainly also fossil rhinoceros-horn. This point of view is easy to understand when we consider that mammoth and rhinoceros occurring there only in fossil remains are utterly unknown to most people as animals, and that tusks and horn are often enough found scattered and detached from any bodily parts; further, that narwhal and walrus are familiar to a minority of maritime people only and again unknown to the inland tribes, and that along the northern shores of Siberia stretches of land occur where immense masses of mammoth and rhinoceros bones are accumulated together with those of stranded walruses and fossil tusk of the narwhal (compare A. E. F. v. NORDENSKIÖLD, *Die Umseglung Asiens und Europas auf der Vega*, Vol. I, p. 378, and K. v. DITMAR, *Reisen und Aufenthalt in Kamtschatka*, p. 37, St. Pet., 1890). It further remains to be noted that in many cases it is not the complete horn or tusk which is traded by the Siberian and Russian ivory hunters, but merely a fragment; hollow and rotten portions are cut off as useless, as soon as the best preserved pieces have been picked out, and the remainders which are still of a considerable size are again sawn into parts of smaller dimensions to be rendered fit for transportation on the pack-horses. Hence perhaps the statement of Hung Hao that the *ku-lu-si* is not very large. The dealer who buys up this material, and the final consumer remote from the place of production, therefore, have little or no occasion to obtain a clear idea of the origin of the product, still less of the character of the animal from which it may have come. The door was thus open for fabulous speculations of all sorts, and part of the lore which the Chinese and Arabs coined in regard to the 'horn', may have reached them directly from Siberia.

no confusion whatever in the early Chinese authors (as it has crept into the accounts of the Arabs) with any other animal than the one indicated; the association of the tusk with rhinoceros-horn is a subsequent development nourished by the similar medicinal employment of both substances and arising only in popular belief, but not proving in fact that both were alike¹). Another argument in favor of our identification is the yellow color emphasized by Hung Hao, which is peculiar to walrus ivory after long exposure to air and moisture (see below), and another proof is presented by the statement of Hung Hao that *ku-tu-si* is made into sword-hilts or knife-handles, and there is the interesting coincidence in the report of al-Bērūnī that the Bulgar cut the same implement out of "fish-teeth brought from the northern sea." This northern sea is the sea of the northern coast of Russia, and from the Russian accounts to follow it will be seen that the "fish-teeth" of the old Russian documents, as proved long ago by the famous historian KARAMSIN, were walrus tusks,

The earliest reference to such sword-hilts is contained in GAIUS JULIUS SOLINUS, who lived in the first half of the third century A. D., author of *Collectanea rerum memorabilium*, revised in the sixth century under the title of *Polyhistor*. In Chap. XXXV he has a report regarding sword-hilts made by the inhabitants of ancient

1) BRETSCHNEIDER's (*Mediaeval Researches*, Vol. I, p. 153) contributions to the elucidation of *ku-tu-si* are now, of course, without any value, as the *Liao* and *Kin* texts were unknown to him; these do not refer to Africa with its horned adders nor to any locality where the rhinoceros occurs, but to the extreme north-east of Asia where neither exists, and only walrus and narwhal come into question. We shall see that, besides the inward evidence yielded by the early Chinese definitions of the name, there are convincing geographical and ethnological reasons upheld and corroborated by recent trade relations which explode any speculations connecting *ku-tu-si* with rhinoceros, mammoth, or suchlike, and which raise the identification with walrus and narwhal to a well assured fact.

Ireland from the teeth of a marine animal¹). K. E. v. BAER²) is inclined to derive this ivory from the narwhal rather than from the walrus which does not occur at all in the British seas, while the narwhals sometimes descend far southward; in the eighteenth century a narwhal was seen stranded at the mouth of the Elbe, and another at the mouth of the Weser, while no similar example exists in the case of the walrus.

According to L. v. SCHRENCK who traveled in the Amur region from 1854 to 1856, the walrus was known to the Gilyak at that time only by name from its teeth which they received through the medium of the northern neighboring tribes in times prior to the Russian colonization on the Amur. Since 1853 they have traded them from the Russian-American Compagnie at Nikolayevsk, for the purpose of bringing them to the Chinese on the Sungari, and exchanging them with profit for other objects³). A long-enduring familiarity with the work of L. v. SCHRENCK has accustomed me to place great confidence in the observations of this scholar; while engaged in a study of the ethnology of the Amur region in 1898—99, I naturally had his publications in my hands almost daily and had ample occasion to test his observations which, though they can certainly be widened, supplemented, and deepened, I generally found accurate to a high degree. On his authority it may therefore be accepted as a fact that in the nineteenth century the Gilyak were the middlemen in the trade of walrus ivory between the high north-east corner of Asia and the Chinese on the Sungari, and probably so long before that time. It is noteworthy that it was the Sungari region where the distant arctic products coming down the valley

1) Qui student cultui dentibus mari nantium belluarum insigniunt ensium capulos. Candicant enim ad eburneam claritatem.

2) *Anatomische und zoologische Untersuchungen über das Wallross (Mémoires de l'Académie imp. des sciences de St-Petersbourg, sixième série, Vol. IV, 1838, p. 224).*

3) *Reisen und Forschungen im Amur-Lande, Vol. I, p. 179 (St. Petersburg, 1858).*

of the Amur finally reached their destination, for this recent fact gives us a welcome clue as to how the same articles may have found their way into the realm of the Khitan at an earlier period. We know that the Gilyak are very shrewd and energetic tradesmen and have taken an active part in the distribution of commercial goods resulting in long journeys which bring them in contact with Manchu and other Tungusian tribes, as well as Chinese, Ainu, Japanese, Yakut and Kamchadal. The observation which is due to I. v. SCHRENCK bears out the fact that walrus ivory has really transgressed the boundary of China; thus, this ivory trade is not a purely academic construction based on documentary evidence exclusively.

W. JOCHELSON¹) has compiled a list of the goods exported in 1899 from Gishiginsk and Barou Korff's Bay, the territory of the Koryak, to Vladivostok. The quantity of walrus-tusks in that year is figured at 25 *pud* (the equivalent of 900 pounds English) to the value of 620 rubles²). I have no information on the further handling of this merchandise at Vladivostok, but am under the impression that it arrives there only in transit bound for other ports. Ivory is not worked there, and it seems plausible to assume that China and Japan will receive a due share in these spoils. It remains open for investigation as to how far walrus and narwhal ivory have been

1) *The Koryak* (*Memoirs Am. Mus. Nat. Hist.*, Vol. X, p. 775).

2) This is certainly only a small percentage of the total output of this material. "It is stated on the highest authority that for several years preceding 1870 about one hundred thousand pounds of walrus ivory was taken annually, involving a destruction of not less than six thousand walruses. Later statistics show that for many years following this date the catch of walrus in Bering Sea was not far from ten to twelve thousand annually. The wholesale slaughter continued until the herds became so reduced in numbers that their pursuit was commercially unprofitable. This destruction was additional to the number usually killed by the natives to supply their domestic needs and for barter" (J. A. ALLEN, *Am. Mus. Journal*, 1913, p. 42). In this interesting article Allen sounds a timely warning: the extermination of the walrus will be accomplished in a few years unless steps are immediately taken for effective protection. In some districts the life of the natives, for this

or are still utilized in the ivory carvings of those two countries¹⁾. F. E. BEDDARD²⁾ makes the statement that the tusk of the narwhal was employed in Europe in the past as a drug and is so used in China to-day; I am not prepared to confirm or to refute the latter assertion, but should not wonder if it were correct. And finally it should be mentioned that S. WELLS WILLIAMS³⁾ gives the following information: "The teeth of the sperm whale, walrus, lamantine, and other phocine animals, form an article of import in limited quantities under the designation of 'sea-horse teeth'; these tusks weigh from sixteen to forty ounces, their ivory being nearly as compact though not so white as that of the elephant⁴⁾."

We read above in the account of al-Bērūnī that the Bulgar bring from the northern sea teeth of a fish over a cubit long. Now this matter has been made the subject of a profound and ingenious historical research as early as 1835 on the part of K. E. v. BAER⁵⁾ whose work is still considered (and justly) by naturalists as a classical treatise. Had Wiedemann had access to it, he could not have

reason, is in a precarious condition. BOGORAS (*The Chukchee, Jesup North Pac. Exp.*, Vol. VII, p. 122) reports that to the south of Anadyr the walrus have greatly diminished in numbers, and that the Kerek on the southern shore of Anadyr Bay, who in former times subsisted on walrus, are now rapidly starving to death.

1) The most interesting account of the ivory industry in the East will be found in A. DE POUVOURVILLE, *L'art indochinois*, pp. 183—191 (Paris, no year).

2) *A Book of Whales*, p. 248 (New York, 1900).

3) *The Middle Kingdom*, Vol. II, p. 400 (New York, 1901).

4) The "List of Chinese Medicines" published by order of the Inspector General of Customs (Shanghai, 1889, p. 445) registers *hai ma* 海馬 *Hippocampus* sp. as production of Kuang-tung, but not *hai ma ya*. The term *hai ma* has been adopted as the rendering of walrus by the English and Chinese Standard Dictionary (Vol. II, p. 2605), and 海馬或獨角魚之齒 is the translation of marine ivory (Vol. I, p. 1261).

5) *Anatomische und zoologische Untersuchungen über das Wallross (Trichechus Rosmarus)*, in *Mémoires de l'Académie imp. des sciences de St.-Petersbourg*, sixième série, Vol. IV, 1838, pp. 96—236 (with a map showing the distribution of the walrus). What later authors have written on the historical development of our knowledge of the animal, is nearly all derived from this fundamental investigation. A good deal of it is reproduced by J. A. ALLEN, *History of North American Pinnipeds*, pp. 82 et seq. (Washington, 1880).

doubted for a moment that the *chutwo* of the Arabs is the tusk of the walrus (the narwhal, though an entirely distinct animal, must be included, as in commerce hardly any distinction is made between the ivory yielded by the two species).

According to the thorough investigations of the great naturalist K. E. v. BAER the first acquaintance of Europe with the walrus dates from the latter part of the ninth century and is connected with the daring exploits of the Norseman Ohthere from Helgeland in Norway who between 870 and 880 sailed around the North Cape to Biarmia (the modern word Perm) and reported on this enterprise to King Alfred the Great of England¹). The main purpose of his voyage was to obtain "horsewhales (*horshvael*), which have in their teeth bones of great price and excellencie." It appears that on the coast of the North Polar Sea the chase pursuit of the walrus had been going on for some time, and this is confirmed by Russian accounts. The Anglo-Saxon report (and this makes its historical value on which v. BAER lays great emphasis) bears out the fact that walrus-hunting and trade in walrus-teeth took their starting-point in the ninth century from the northern coast of Russia and long preceded the discovery of Greenland. In the sources of Russian history walrus-teeth are known as fish-teet²). The famous Russian historian KARAMZIN has solved this question by appealing to HERBERSTEIN who published in 1549 his work *Rerum Moscoviticarum Commentarii*, a primary source for the history of Russia. This author gives a very plain and reliable account of the walrus, insists on the great value attached by the Russians, Turks and Tatars to the teeth,

1) Ohthere's account is preserved in the first chapter of King Alfred's (848—901) edition of the *History of the World* (*De miseria mundi*) by Paul Orosius. The first chapter contains a geographical introduction to the work, in which the account of another Norseman, Wulfstan, regarding a voyage into the southern part of the Baltic Sea is included.

2) Not only in Europe but also in Asia the naïve conception prevailed that the walrus was a fish. The Yakut simply call the animal *balyk*, i. e. a fish.

and remarks that they are called fish-teeth. Still earlier in 1517 the learned Pole MATTHIAS MECHOVIUS in his *De Sarmatia Asiana et Europaea*, after giving a correct description of the walrus, says: "Hos illae gentes colligendo dentes eorum satis magnos latos et albos pondere gravissimos capiunt: et Moschovitis pendunt atque vendunt: Moschoviae vero his utuntur: ad Tartariam quoque et Turciam mittunt, ad parandum manubria gladiatorum, framearum, cultrorum, quoniam gravitate sui majorem et fortiozem impressionem impingunt." Karamsin observes that the expression 'tooth' (зубъ) was not understood in later times, and was taken for a corruption due to copyists, but that walrus-teeth are evidently involved which were used in Novgorod like marten and squirrel-skins in the manner of monetary values; in old Russian tales, these fish-teeth appear as highly priced objects (e. g. a precious chair of fish-teeth), in which case only walrus or narwhal-teeth can be understood. In 1159 the Grand duke Rostislav and the Prince Svätoslav Olgovich made gifts to each other on the occasion of an alliance effected at Morovsk; Rostislav presented sables, ermines, black foxes, polar foxes, white bears, and fish-teeth. During the sway of the Mongols and Tatars frequent demands for this product were made from Asia¹), and Ivan Vasilyevich received in 1476 a fish-tooth as a gift from a citizen of Novgorod. So far v. BAER²). We see that, from the ninth century at least, walrus-tusks formed an important article of trade in the north-east of Europe, that they were known as fish-teeth, and that they were traded to the Turks, and probably reached also inner Asia during the middle ages.

In the period K'ai-yüan (713—742) Hing Kuang, king of Sinfra

1) This affords an explanation for the *ku-tu-si* described by Ch'ang Tê as a product of the Western Regions. It was in my opinion walrus ivory coming from Russia.

2) On p. 224 he refers to FRIÄNN (*Ibn-Fozzlan*, p. 229) as saying that in Kbiwa mammoth-teeth coming from southern Russia and brought to that place by the Bulgar were worked there in early times. These "mammoth-teeth" doubtless were walrus-teeth.

新羅 (in Korea), sent to China as tribute *kuo hia* ponies¹), silk textiles called *chao hia*²), silk textiles called fish-tusks 魚牙紬,

1) 果下馬. First mentioned in *Hou Han shu* (Ch. 115, p. 5) as an animal occurring in the country of Wei 濊 in Korea, and explained by the gloss 高三尺乘之可於果樹下行 *i. e.* "It is three feet high; when riding it, one can conveniently pass under the fruit-trees" (on account of its low stature). According to *San kuo chi* (*Wei chi*, Ch. 30, p. 8 a), such a horse from Wei was offered to China at the time of the Emperor Huan 桓 (147—167 A.D.) of the Later Han dynasty; the gloss there added is the same, with the addition at the end "hence it is called *kuo hia*" (故謂之果下). According to *Wei shu* (Ch. 100, p. 2 a) and *Pei shi* (Ch. 94, p. 4 a: account of Kokuryō) these three feet horses, called *kuo hia*, were reared also in that Korean kingdom and believed to descend from those which Chu Mung had broken in; Chu Mung 朱蒙 is the legendary founder of the kingdom of Kokuryō (*Kao-kou-li*), the son of the sun-god, who was in his youth the groom of the king of Fu-yū, at which time he made a close study of horses (compare *P'ei wên yüen fu*, Ch. 51, p. 9 b, which does not quote the oldest reference in the *Hou Han shu*). A. PRIZMAIER (*Nachrichten von den alten Bewohnern des heutigen Corea, Sitzungsberichte der Wiener Akademie*, 1868, p. 501) did not recognize *kuo-hia* as the name for this breed of horse and translated the phrase 卽果下也 in the latter passage: "But they truly are inferior horses". — This dwarf-breed of pony is still a famous production of Korea. "In size when alongside of a Western horse, it looks like a ten-year-old boy accompanying his grandfather, or like an ordinary Japanese walking out with Li Hung-chang", remarks J. S. GALE (*Korean Sketches*, p. 119) who has devoted to the animal an essay accompanied by a photograph of it. H. B. HULBERT (*The Passing of Korea*, p. 256) has the following: "History and tradition have much to say about this breed of horse. As far back as ancient Yemak, which flourished at the beginning of our era, we read that the horses were so small that men could ride under the branches of the fruit trees without striking their heads against them. From time immemorial the island of Quelpart has been the famous breeding-place of the hardy pony, and the Mongols established themselves there very strongly in order to breed horses for use in their wars". The reference to Quelpart, pointed out also by A. HAMILTON (*Korea*, p. 270, New York, 1904) as the place of production of large numbers of pack-ponies, is very suggestive as to the origin of this equine race; it is well known that insular isolation has a tendency to produce diminutive forms of mammals, and this observation has especially been made in regard to insular stocks of horses, as *e. g.* those of Ireland and Iceland, and the much smaller ones of the Isle of Man, the Hebrides, Orkneys, and Shetlands. The dwarf horses of Corsica and Sardinia are described also as being three feet high (see particularly E. HAHN, *Die Haustiere*, p. 188, Leipzig, 1896, and C. KELLER, *Studien über die Haustiere der Mittelmeer-Inseln*, p. 125, Zürich, 1911). The above Chinese data are presumably the oldest on record of such an insular dwarfish breed.

2) 朝霞紬. Compare HIRTH and ROCKHILL, *Chau Ju-kua*, p. 218 (and the correction proposed by GILES, *Adversaria Sinica*, p. 394).

and skins of *Phoca equestris*¹⁾ (*Tang shu*, Ch. 220, p. 9b). In the *Ts'é fu yüan kuei* (as quoted in *K'in ting Man-chou yüan liu k'ao*, Ch. 19, p. 5) an embassy from Sinra is more specifically assigned to the year 723, the list of products being the same, with the addition of bezoar 牛黃, ginseng, human hair, steel bells to be tied to the necks of falcons, gold and silver. In 748 the *Mo-ho* of the Sungari (*Hei shui* 黑水) sent likewise silk textiles called fish-tusks and *chao hia* silks, and the same objects are enumerated again in *Kiu Tang shu* (Ch. 199 上, p. 9a), among the tribute gifts offered by Sinra in 773. But in the latter text we meet an important variant reading 獻金銀牛黃魚牙、納朝霞紬等 which means: "They offered gold, silver, bezoar, and fish-teeth; and received (in exchange from the Chinese Court) *chao hia* silk and other goods." Also in *P'ei wén yüan fu* (Ch. 21, p. 124b) this passage is quoted under the catchword *yü ya* 魚牙, though in the text *ch'ou* 紬

1) 海豹 *hai pao*, 'marine panther'. In 730 five of these skins were offered by the P'o-hai and Mo-ho; in 734 sixteen skins were sent by Sinra. The name *hai pao* (probably identical with the 'speckled fish produced in the ocean' 海出斑魚, mentioned in *Hou Han shu*, Ch. 115, p. 5, and *San kuo chi, Wei chi*, Ch. 30, p. 8) distinctly refers to the finest of all marine mammals, the ribbon seal, *phoca equestris* Pallas (also *hystriophoca fasciata*), first briefly described by PALLAS (*Zoographia Rosso-asiatica*, Vol. I, p. 111, St. Pet., 1811), then more accurately by L. v. SCHRENCK (*Reisen und Forschungen im Amur-Lande*, Vol. I, Säugetiere, pp. 182—8, St. Pet., 1858). He who will look up Plate IX in this work and admire the wonderful design on the skin of the male, will readily grasp the appropriateness of the name 'sea panther'. I am the fortunate owner of a skin of this now almost extinct phoca obtained in the northern part of Sachalin in 1898; the Tungus (tribe Emunkun) there call it *alakú*, the Gilyak *alχ*, the Ainu *targa*. Its habitat is formed by the Bering Sea, the coasts of Kamtchatka, the chain of the Kuril Islands, the Okhotsk Sea and Tartar Strait down to the southernmost part of Sachalin. *Ta Ming i t'ung chi* (Ch. 89, fol. 10b; edition of 1461) lists *hai pao* skins as products of Korea and the Su-shên country; other Pinnipedia are enumerated there as the sea-ass, sea-badger, sea-ox, sea-dog, and sea-pig. The latter can safely be identified with *Otaria ursina* L., the so-called fur seal of commerce, as the Tungusian tribe of the Mangun calls it also *mu-nyghly*, 'water-boar' (SCHRENCK, *l.c.*, p. 189). SCHLEGEL's explanation of *hai pao* as sea-lion (*T'oung Pao*, Vol. III, 1892, p. 505) is not very fortunate; the skins of sea-lions being without value would not have been sent to China as tribute.

takes the place of *na* 納. It seems to me that the text of the *Kiu T'ang shu* preserves the correct reading, and that it is the question there of fish-tusks. On the other hand, the existence of the term *yü ya ch'ou* cannot be denied in the other passages where the words *yü ya* are followed by the word *ch'ou*, and apparently two kinds of silks are understood. The expression "fish-tusk silk," as far as I know does not occur otherwise, nor is it interpreted to us in this case, and it can only be guessed that it may have been a weaving with a fanciful design somewhat resembling the natural veins occurring in the "fish-tusk." But whatever the relation of the latter to the weaving may have been, it is obvious that a product like "fish-tusk" must have been known to the people of Sinra and the Mo-ho to enable them to draw such a comparison, and the "fish-tusk" surely was nothing but walrus or narwhal tusk¹), in

1) It could not have been whalebone which is known under the name *k'ing ya* 鯨牙 (*P'ei wén yün fu*, Ch. 21, p. 126). The oldest account of the whale (defined by the *Shuo wén* as a 'big sea-fish', by the *Yü p'ien* as 'the king of the fishes'), I believe, is extant in the *Ku kin chu* 古今注 by Ts'uei Pao of the middle of the fourth century (Ch. 2, p. 9 b; edition of *Han Wei ts'ung shu*) where it is said: "The whale is a sea fish. The biggest are a thousand *li* long, while the smallest reach a size of a hundred feet. One individual brings forth numerous young ones. In the fifth or sixth month they are in the habit of going to shore for the purpose of propagation. In the seventh or eighth month they return with their young ones into the open ocean where they cause an uproar like thunder in rousing the waves and almost produce rain in spirting water out of their jaws. All the water animals, terror-stricken, take to flight, no one daring to offer resistance. The female is called *i(ni)*; the biggest attain likewise a length of over a *li*, and their eyes make bright-moon pearls". 鯨魚者海魚也、大者長千里小者數十丈、一生數萬子、常以五月六月就岸邊生子、至七八月導從其子還大海中、鼓浪成雷、噴沫成雨、水族驚畏皆逃、匿莫敢當者、其雌曰鮠、大者亦長千里、眼爲明月珠。 It is well known that the pearls bright like the moon are listed by the Chinese among the products attributed to the Roman Orient and are frequently mentioned in the texts relative to Ta Ts'in, as may be ascertained by referring to HIRTH's *China and the Roman Orient*, and CHAVANNES, *T'oung Pao*, 1907, p. 181. It should not be supposed, however,

the same manuer as we hear of fish-tooth in the Slavic regions. In this connection the account of the *T'ang hui yao* quoted above may claim great significance, if it can be proved that the passage already occurred in the edition of the *T'ang* period. It is an interesting coincidence, as we now observe, that the Mo-ho, on the one hand, are reported to possess *ku-tu* horn, and on the other hand

that the term *ming yüe chu* was coined only at the time of Chinese relations with Ta Te'in, but as shown by the quotations given in *P'ei wên yüan fu* (Ch. 7 A, p. 97), it occurs twice in the *Shi ki* of Se-ma Ts'ien. In the periods K'ai-yüan (713—742) and T'ien-pao (742—756) the Mo-ho of the Sungari sent as tribute pupils of the eyes of whales 鯨睛, sable-skins and white hare-skins (*T'ang shu*, Ch. 219, p. 6), and according to *Ts'ê fu yüan kuei* (quoted in *K'in ting Man-chow yüan liu kao*, Ch. 19, p. 5), the Mo-ho sent the same objects (鯨鮫魚睛) in 719. *Ta Ming i t'ung chi* (Ch. 89, fol. 10 b; edition of 1461) lists whale-pupils among the products of the country of the Su-shên (compare also SCHLEGEL, *T'oung Pao*, Vol. VI, 1895, p. 41). — The coincidence of Gilyak *keni* (among the Orochon, a Tungusian tribe on Sachalin Island, who call themselves Ulča, I noted *kā'nia* 'whale' with Chinese *k'ing* is curious. MÖLLENDORFF, in a somewhat inconsiderate notice on the Gilyak language (*China Review*, Vol. XXI, p. 143) in which he "proves" to his own satisfaction the relationship of Gilyak with the Ural-Altai languages, makes Grube say that *keni* is a Chinese loanword in Gilyak. GRUBE has never said anything so foolish as that, but has simply recorded the word, without further comment, from the notes of Schrenck in his *Giljakisches Wörterverzeichnis*, p. 56 (Anhang zu Schrenck's *Reisen und Forschungen im Amur-Lande*, St. Pet., 1892). It is entirely out of the question that the Gilyak word is derived from Chinese. If there is any people in eastern Asia thoroughly familiar with the whale, it is certainly the Gilyak; they are the only ones among the Amur tribes to hunt the whale (*Balaenoptera longimana*) and surely know as much about the animal and its habits as the Chinese. The beach along the east coast of Sachalin is strewn with skeletons of castaway whales, and whale-bone is amply utilized by the Gilyak in their industries, e. g. for the runners of their sledges. The Orochon word *kā'nia*, moreover, shows that the word *keni* or more correctly *kūni* is a specific Sachalin word, for the Tungusians on the mainland designate the whale as *kā'lym*, the Gold on the Amur as *kā'lyma*. As the word *kūni* is absent on the mainland, it is most improbable that the Chinese word can be traced back to it, and the coincidence may be accidental. — The subject of the whale has also a slight bearing on Chinese art, in that the whale has sometimes been associated with the dragon. SCHLEGEL (*T'oung Pao*, Vol. VI, 1895, p. 42) has furnished an example of a whale being cast off on the coast of Chê-kiang and regarded by the people as a dragon. In the *Fang shi mo p'u* of 1588 (Ch. 4 下, p. 52) is an illustration of a *kūan k'ing pao chu* 玄鯨寶柱 'precious pillar (*ratnastambha*) of the black whale'. The pillar crowned with five rows of jewels in Buddhist style and adorned with lotus designs at the base is wound around by a dragon, head downward and tail upward, with the body and tail of a fish.

to be acquainted with fish-teeth. The one, however, must be identical with the other. The Mo-ho were a Tungusian tribe related to the Khitan, and it would be no marvel after all if they had been in possession of that Tungusian word as early as the Tang period. There can be no doubt of the fact that the trade in the article makes itself felt in that epoch, and that the Mo-ho and the Koreans took an active part in it. This affords the strongest historical evidence for the fact that *ku-tu-si* cannot have been the product of the rhinoceros nor of the mammoth, neither of which occur in the territories of Korea and the Mo-ho, but this ethnographical indication opens the way to the northern Pacific Ocean and brings us in immediate contact with the ivory produced in its waters. The Mo-ho bordered on the ocean along the shore stretching between the Korean peninsula and the mouth of the Amur¹⁾, and thus were next-door neighbors to that stock of North-east Asiatic tribes which are often designated Palae-Asiatic, but which I prefer to comprise under the term of the North-Pacific culture-area.

As a last resort, Chinese trade in marine ivory leads us back to the culture of those arctic peoples settled along the northern shores of Asia and America who hunt the narwhal and walrus for the sake of their flesh, blubber, and tusks, and whose work in ivory carving forms an essential feature of their cultural achievements. The wide geographical distribution of this industry over vast and scattered tracts of circumpolar land is amenable to the belief that

1) A rather clear allusion to walrus-tusk in the same region is made in the Imperial Geography of the Ming Dynasty (*Ta Ming i t'ung chi*, edition of 1461, Ch. 89, fol. 10 b) where *shu kio* 珠角 is recorded as one of the products of the country of the *Su-shén*, a gloss being added to the effect 卽海象 "this is the sea-elephant". Sea-elephant and latinized *Elephas marinus* was the common name by which the walrus was known in Europe during the sixteenth and seventeenth centuries, and more particularly in those countries of Europe where only the teeth were traded but little accurate accounts of the animal were spread (K. E. v. BAER, *l. c.*, pp. 109, 117).

it is very ancient, and not only the art but also the religion and mythology of the Eskimo, in particular their highly organized system of taboos, with which narwhal and walrus are closely interwoven¹), point to a great antiquity as regards their acquaintance with these animals.

W. BOGORAS, our great authority on the Chukchi, has given a vivid description of walrus-hunting as practised by this people²). The trade formerly carried on by it in the tusks must have been enormous: official records among the archives of Kolyma reveal the fact that, in 1837, 1563 walrus-tusks were sold at the fair of Anui first established in 1788³).

The Koryak employ for carving, W. JOCHELSON⁴) informs us, different kinds of wood, the antler of reindeer and the horn of

1) BOAS, *The Eskimo of Baffin Land and Hudson Bay* (*Bulletin Am. Mus. Nat. Hist.*, Vol. XV, 1901, pp. 122, 123). Narwhal and walrus themselves are carved from ivory by the Eskimo (BOAS, *The Central Eskimo*, plates 8 and 9; MURDOCH, *The Point Barrow Eskimo, Ninth Annual Report Bureau of Ethnology*, 1892, p. 272); the walrus also by the Chukchi (v. NORDENSKIÖLD, *Umsegelung Asiens und Europas auf der Vega*, Vol. II, p. 129) and the Koryak W. JOCHELSON, *The Koryak, Memoirs Am. Mus. Nat. Hist.*, Vol. X, p. 662). The objects carved by the Eskimo from ivory are numerous: knife-blades, handles for skin-scrapers, ends for back-scratchers, tops for spinning, dice, combs, needle-cases, snuff-boxes, tobacco-pipes, beads for hair-ornaments, bows, ear-trumpets used by hunters at the seal-hole to hear more readily the noise made by the emerging seal, and animal-carvings.

2) *The Chukchee*, I. Material Culture, *Jesup North Pac. Exped.*, Vol. VII, 1904, pp. 122—123.

3) *Ibid.*, p. 56. American whalers now accept walrus ivory in payment of goods furnished to the Chukchi (p. 63). They carve from ivory beads and buttons used for personal adornment (pp. 259, 260), and large numbers of animal figures, many examples of which are illustrated in the work of v. NORDENSKIÖLD (*l. c.*, Vol. I, p. 463; Vol. II, pp. 128—141).

4) *Material Culture and Social Organization of the Koryak* (*Memoirs Am. Mus. Nat. Hist.*, Vol. X, p. 646). Before their acquaintance with iron the Koryak used stone implements in working bone. The walrus-tusks were split into strips by means of stone chisels and wedges, and the work was continued with the aid of stone knives and awls. At present tusks are sawed with an iron saw, home-made or imported, and the rest of the work is accomplished with a knife (p. 670).

mountain-sheep, bone of whale, teeth of the white whale and the bear, walrus-tusks, and mammoth ivory. Sometimes the horn of the narwhal, brought from the shores of the Arctic Ocean, is also used. The material most suitable, on account of its solidity and fineness of grain, is ivory of the walrus and mammoth, especially the latter, which is as hard as the former, walrus-tusk being used to a greater extent than mammoth-tusk, because the latter is not found so frequently in the Koryak territory as in the more northern regions of the Chukchi. Jochelson points out that both kinds of ivory, when exposed to the air and moisture for a long time, lose their original whiteness and acquire a yellow tobacco color¹). The sculpture of the Maritime Koryak who carve figures of wrestlers and drummers is most remarkable for the lifelike action and motion of representation and sharply contrasts in this point with similar efforts of the Maritime Chukchi and Eskimo who merely grasp to a certain extent the exterior forms of an animal but represent it in a stiff and motionless manner. Besides artistic carvings, the Koryak further make thimbles, rings, and particularly chains of ivory²), the latter carved out of a single piece of bone.

If the length of the preceding notes may seem somewhat unduly out of proportion with the subject proper, I wish to say, by way of apology, that it was necessary to point to the central region from which this peculiar Chinese trade in *ku-tu-si* has radiated, and to insist upon the antiquity and importance which the marine product must have had in the extreme north-east of Asia. The mere lack of historical documents for that culture-area cannot prevent us from

1) This chimes in with the yellow color which Hung Hiao attributes to *ku-tu-si*. I have examined a large number of Eskimo ivory carvings in the collections of the Field Museum, and find that stained pieces range from a light yellow to a deep brown, while others have retained their pure whiteness; but the latter may be supposed to be narwhal ivory.

2) *Ibid.*, pp. 626, 670.

regarding the utilization of ivory there as being of considerable age¹⁾, and as having given the impetus to a trade in this product moving in a southerly direction and reaching the Mo-ho and Korea before the eighth, and the Khitan before the tenth century. *Vice versa*, the Chinese accounts corroborate the necessary supposition that an ivory industry must have existed in those early days in the far north, and that the peoples living there must have pursued the capture of the sea-mammals yielding the precious material²⁾.

1) Also v. NORDENSKIÖLD (*l. c.* p. 137) justly says that long before historical times the walrus has been captured by the polar peoples, and that implements of walrus-bone appear among the grave-finds in the north of Europe.

2) The location of *ku-tu-si* in the country of the Khitan, the two Khitan words *ku-tu-si* and *tu-na-si*, the acquaintance of the Koreans with walrus-tusk, and the modern trade in this article of the Koryak and Gilyak necessarily lead us to the inference that the transportation of walrus and narwhal ivory always moved along the north-east coast of Asia, as an offshoot of the North-Pacific culture-area. It remains to be considered that besides this natural maritime route there may have been an inland commercial high-road from inner Siberia into the region of the Khitan. An indication to this effect may be gleaned from the interesting geographical text inserted in *Wei shu*, Ch. 100, p. 6 (identical with *Pei shi*, Ch. 94, p. 10 b). The Shi-wei, a tribe akin to the Khitan, inhabited under the T'ang a territory bordered in the east by the Mo-ho of the Sungari, in the west by the Tu-küe, in the south by the Khitan, in the north by the sea, the centre of their habitat being formed by the basin of Kerulen River (compare CHAVANNES, B. E. F. E. O., Vol. III, 1903, p. 225). According to the text of the *Wei shu*, more than a thousand *li* west of the Shi-wei was the country of the *Ti-tou-kan* 地豆干, (or *Ti-tou-yü*?), and more than 4500 *li* north of the latter was the country of the *Wu-lo-hou* 烏洛侯. "North-west of this country there is the river *Wan* 完水 which flows in a north-easterly direction and unites with the river *Nan* 難水. The small streams of this territory all discharge themselves into the *Nan* which flows in an easterly direction into the sea. After a twenty days' journey toward the north-west is encountered the Great Water *Yü-ki*(?)*ni* 于己尼大水 which is called the Northern Sea". 其國西北有完水、東北流合于難水、其地小木皆注於難東入于海、又西北二十日行有于己尼大水所謂北海也。WASILYEF (Труды Восточнаго Ома. Цмп. Археолог. Общества, Vol. IV, p. 33, St. Pet., 1859) regards this Northern Sea as Lake Baikal and the two rivers as Onon and Selenga, and there is certainly much in favor of such a view. On the other hand, there are grave obstacles in the way of such an interpretation; the Selenga falling into Lake Baikal seems to me

While the North-Pacific world was still unknown and covered by a dense veil, we hear the pulsation of human labor beating there in the Chinese records of Arctic ivory. No part of the world, to our modern way of thinking, stands any longer in rigid isolation; lands and peoples of the farthest Thule draw nearer and nearer and join into the general frame of history. Those who have pursued the epoch-making results of the Jesup North Pacific Expedition — the publications of which are still in progress under the energetic editorship of Franz Boas, its spirited leader, — are now familiar with the fact that Asia and America are overbridged, and that migrations of tribes as well as currents of thought and culture have passed from one continent to the other. With reference to our present subject, another matter of Asiatic-American interest here deserves mention, as briefly as possible. In the *Annals of the Three Kingdoms* (*San kuo chi*, *Wei chi*, Ch. 4, p. 13 a) it is on record under the third year of the period King-yüan (262 A. D.) that the country of the Su-shên sent a tribute of thirty bows three feet and five inches long, arrows of the wood *ku* 楛¹) one foot and

quite out of the question as capable of being identified with the river *Wan* which, as is plainly said in the text, flows into the eastern ocean. The *Amur* can hardly be intended, being too well known to the Chinese to suppose that a suppression of its usual name might be intended in this context. If the *Shi-wei* were located in the basin of the *Kerulen*, the distance of 5500 *li* partly west and partly north of this territory would apparently carry us much farther than the valley of the *Onan* and probably lead us into the river system of the *Witim* and *Lena*. The identification of the *Pei Asi* with the Arctic Sea of the Siberian coast, however, would be beset with no small difficulties. Far from pretending to solve the problem, I merely wish to intimate that the text of the *Wei shu* is capable of a different interpretation than the one advanced by *Wentz*. The mode of interpretation has no direct principal issue for the point under consideration. With reference to the pending question the vital point of the argument is that the *Khitans* (as later the *Niüchi*), in the west and north-west, were backed by a number of tribes connecting them and their culture with the very heart of *Siberia*, and were influenced by commercial and mental currents coming from that direction.

1) An unidentified tree, mentioned as early as in the *Yü kung* (compare *BERTSCHNEIDER*, *Bot. Sin.*, pt. 2, N°. 543). In the place of *ku*, other texts write *jo* 楛, also unexplained

eight inches long, three hundred stone crossbows 石弩, a mixed lot of twenty armors of leather, bone, and iron 皮骨鐵雜鎧二十領, and four hundred sable-skins. Hide armor and bone armor formed the national defensive weapons of the Su-shên, as may be inferred from a passage in the Annals of the Tsin Dynasty (*Tsin shu*, Ch. 97, p. 2 b) where the characteristic weapons of the tribe are enumerated as, "stone crossbows, hide and bone armor 皮骨之甲, bows from the timber of the tree *t'an*¹⁾ 檀弓, three feet and five inches long, arrows from the wood *hu*, one foot and eight inches long 長尺有咫." The subject revealed by these two memorable passages has a large bearing on American ethnology and the history of plate armor in America and Asia, and has been discussed at full length by me in an address delivered on January 2 of this year before the meeting of the American Anthropological Association at Cleveland under the title "Plate Armor in America, a sinological contribution to an American problem"²⁾. Only a few indications can find place here. It is noteworthy that the Chinese do not ascribe bone armor to any other of the numerous tribes with which they came in contact during their long history, and whose culture they have described to us. In all likelihood the term 'bone armor' occurs in their records only in those two passages, and it is not at all ambiguous. There is but one

(*ibid.*, N^o. 569). The arrowheads of the Su-shên and allied tribes were chipped from flint. The principal passages relating to the flint arrowheads 石鏃 of the ancient Tungusian tribes are *Hou Han shu*, Ch. 115, p. 2 b; *San kuo chi*, *Wei Chi*, Ch. 30, p. 7 b; *Tsin shu*, Ch. 97, p. 2 b; *Wei shu*, Ch. 100, p. 4 a; *Pei shi*, Ch. 94, p. 7; *T'ang shu*, Ch. 219, p. 5 b (compare *Jade*, pp. 57 *et seq.*). *Hu* arrows and stone crossbows of the Su-shên were sent as tribute from Korea in 458 A. D. (*Nan shi*, Ch. 79, p. 1 b).

1) *Dalbergia hupeana*, yielding the well-known blackwood of commerce from which carvings and furniture are turned out at Canton and Ningpo. In the above case, another species of the Amur Region seems to be meant.

2) A brief abstract of this address has appeared in *Science*, Vol. 37, 1913, p. 342. Its publication in full is hoped for in the near future.

thing that can be understood by it (and my friends working in the field of American ethnology are agreed with me on this point), — the well-known type of bone plate armor, consisting of rows of overlapping plates of ivory, as still occurs among the tribes occupying the northern shores of the Pacific on the American and Asiatic sides, particularly among the Eskimo and Chukchi, and in that region exclusively. The plates in this type of armor are usually carved from walrus ivory, as naturally possessing a greater elasticity than other ordinary kind of bone. The point at issue, then, is the fact that the entry of the Chinese annalist under the year 262 regarding the presentation of bone armor on the part of the Su-shên is the earliest recorded reference in history to plate armor of presumably walrus ivory, and hence the earliest instance of an object wrought from this material. We now recognize also that the Geography of the Ming Dynasty, as previously stated, is quite right in assigning walrus ivory to the country of the Su-shên. In the tracing of this article we are thus carried far beyond the time when the word *ku-tu-si* made its début; we see that, prior to the age of the Khitan, Mo-ho and Koreans, the Su-shên were in possession of walrus ivory, at least earlier than the year 262, and probably worked it themselves into plates for defensive armor. Narwhal and walrus ivory became known likewise to the Japanese. F. W. K. MÜLLER¹) called attention to the fact that the word 一角 is read in Japanese *unkōru* or *unikōru* (our word *unicorn*), when a commercial product brought to Japan by the Dutch (more correctly perhaps in earlier times by the Portuguese) comes into question, and quotes

1) Ikkaku Sennin (reprint from *Bastian-Festschrift*, p. 24). The English and Chinese Standard Dictionary (published by the Commercial Press of Shanghai, 1908, Vol. II, p. 1505) has adopted the old European term 'sea-unicorn' in the translation of the word narwhal by 獨角魚 or 一角魚.

RÉMUSAT¹⁾ as saying that in this case rhinoceros-horn is hardly understood but rather narwhal-tusks. The walrus is equally entitled to consideration, as the teeth of the two animals are not discriminated in commerce. At the end of the eighteenth century shipwrecked Japanese sailors cast off on the Aleutian Islands acquainted their countrymen with a somewhat romantic but unmistakable sketch of the walrus²⁾, and it happens that walrus get astray into Japanese waters. Captain H. J. SNOW³⁾ remarks on this point: "The writer has never seen the walrus about the Kurils, or even south of Avatcha Bay, on the Kamchatka coast. A stray one, however, was taken some years ago near Hakodate, in Tsugaru Strait, which must have passed along the Kurils from the north." It seems, however, that prior to the time of Portuguese and Dutch trade narwhal and walrus ivory were known in Japan. At least, A. BROCKHAUS⁴⁾, evidently from a Japanese source, makes the statement that both materials inclusive of elephant ivory (*zôge*) were utilized for the carving of *netsuke*, and remarks that narwhal tooth, alabaster-like, was taken during the middle ages also in Japan for the horn of the unicorn, being regarded as an infallible antidote against poison and paid dearer than gold⁵⁾.

1) *Notices et extraits des manuscrits de la Bibliothèque Nationale*, Vol. XI, pt. I, p. 198 (Paris, 1827). Dr. Müller accepted this interpretation of Rémusat without reserve; but whoever will look up the sketch of the horn supplied by the *Wa-Kan San-sai-zu-e* (the Japanese edition of the Chinese *San ts'ai t'u Anu*) on which the argument of Rémusat and Müller is based, can not fail to notice that the horn slender and curved as there represented can only be tusk of a walrus, not that of a narwhal which is perfectly straight, pointed, and twisted in grooves. The Japanese illustration is very distinct and true to nature; it strictly excludes any notion of a rhinoceros-horn, and as could be confirmed from actual comparison with the stuffed specimen of a walrus in the Field Museum, refers only to the tusk of this animal.

2) Reproduced by A. E. v. NORDENSKIÖLD, *Die Umseglung Asiens und Europas*, Vol. I, p. 140, where a detailed account of those Japanese sailors and their diary is given.

3) *Notes on the Kuril Islands*, p. 28 (London, 1897).

4) *Netsuke, Versuch einer Geschichte der japanischen Schnitzkunst*, p. 26 (Leipzig, 1905).

5) It would be interesting to know from what Japanese source this information is

Under the Liao and the Kin, *ku-tu-si* does not seem to have entered the pharmacopœa¹); at least we do not know, Hung Hao mentions only the one practical utilization for knife-hilts. It is

derived, and what the Japanese names for narwhal and walrus ivory are. On p. 26 of his interesting and attractive work, Mr. Brockhaus quotes from the Japanese book *Soken kissho* of 1781 the sentence that "there is a material sold by tricky dealers under the name *siogyo koten* (人魚骨), said to be the lower jaw of a shark", and concludes that this might be an error, as the bones of the 'siren' or 'mermaid' of antiquity, the dugong and the whale, were used like ivory. But *siogyo* (Chinese *shên yü*) is an ancient general designation for Pinnipedia which occurs as early as Se-ma Ts'ien's *Shi ki* (CHAVANNE, *Les mémoires historiques de Se-ma Ts'ien*, Vol. II, p. 195), and G. SCHLEOFL (*Toung Pao*, Vol. III, 1892, pp. 506—9) has proved with good arguments that these 'human fish' or 'mermaids' of Chinese lore are nothing but seals. The Chukchi carving of a seal with a human head figured by W. BOGONAS (*Memoirs Am. Mus. Nat. Hist.*, Vol. XI, p. 329) is the offshoot of these beliefs in the human character of seals, which is emphasized also by modern observers (*e. g.* Steller). Moreover, Captain SNOW (*l. c.*, p. 84) observes in regard to the sea-lion that its large canine teeth, some of which are nearly four inches in length, and of the consistency of ivory, are sometimes carved by the Japanese into *netenke*.

1) This is confirmed by the fact that the work of Li Shi-chên is the first and only *Pên ts'ao* to make mention of *ku-tu-si*, while the article is absent from the *Chêng lei pên ts'ao*, the *materia medica* published in 1208 by the physician T'ang Shên-wei 唐慎微. BRETSCHNEIDER (*Bot. sin.*, pt. 1, p. 47), while accurately describing this work, confesses that he never came across it, though it is still extant. Two Ming editions in folio were secured by me in Si-ngan fu, those of 1523 and 1587. The following bibliographical references are based on the notes of Mo Yu-chi (Ch. 8, p. 5) quoted above. The *editio princeps* of 1108 known as the Ta-kuo edition was followed by a reprint issued under the Sung in the period 1111—18 and hence designated as the Chêng-ho edition. The latter was republished under the Kin in 1204, with re-editions in 1206 and 1214. A facsimile of the Sung print saw the light under the Yüan in 1302. From the Ming period no less than six editions are noted by Mo Yu-chi: 1468, reprint of the Kin edition of 1204; 1523, facsimile of the Sung print; 1572; 1577, reprint of the Yüan edition, followed by a new edition in 1579; finally 1598, the last three falling within the period Wan-li. Under the Manchu only one edition was published in 1656 in the reign of Shun-chi, which seems to be the last. It will be recognized that the *Chêng lei* maintained its place till the appearance of the *Pên ts'ao kang mu* in 1596 supplanted it. The T'ien-lu-lia-lang 天祿琳琅 Library possessed copies of the Sung, Kin, and Yüan editions. The importance of the work rests on the fact that it reflects the tradition of the science of the Sung period and contains many ancient texts excluded from its successor, while other extracts often mutilated by the latter are reproduced in a more complete or more correct form. Also its illustrations are of interest, and there are many not adopted by Li Shi-chên.

apparent from the two words *ku-tu-si* and *tu-na-si* stated as belonging to the Khitan language that the last syllable is part of the Khitan word-stem, and not a Chinese addition to a stem *ku-tu* or *ku-tur*, and *tu-na*. If the character *si* 犀 was chosen to transcribe in Chinese the syllable *si* in the two Khitan words, the reason was, as has been explained, that walrus and narwhal tusk was looked upon as a horn, and *si* 犀 means not only rhinoceros but also rhinoceros-horn¹). This conception of the tusks as horns and the suggestive writing of the word resulted during the Mongol period in the thought development that *ku-tu-si* was regarded as an effi-

1) The Turkish and Arabic forms *hütü* and *chutwo* naturally presuppose a Chinese *ku-tu* in which the final *si* was dropped. This hypothetical *ku-tu* I take as the Chinese colloquial word formed after the Khitan word *kutusi*. The peculiar way of writing this word leading to its association with rhinoceros-horn produced among the Chinese the notion appearing during the Mongol period that the word *ku-tu-si*, separated into *ku-tu* *si*, was a formation by analogy with the numerous varieties of rhinoceros-horn, as there are *t'ung-t'ien si* 通天犀 'the horn communicating with the sky', *pi-han* 辟寒 *si*, 'the cold-dispelling horn', *pi-shu* 辟暑 *si*, 'the heat-dispelling horn', *ye-ming* 夜明 *si*, 'the horn shining at night', *kuan-fén* 闕忿 *si*, 'the wrath-removing horn', *pi-ch'en* 辟塵 *si*, 'the dust-dispelling horn, and others (which are all discussed in the forthcoming publication previously alluded to). For this reason the process of eliminating the word *si* was easy, and in the same manner as *t'ung-t'ien* was said in lieu of *t'ung-t'ien si*, also *ku-tu si* was by way of analogy abbreviated into *ku-tu*; hence the corresponding Turkish and Arabic forms whose existence renders the supposition of a Chinese *ku-tu* necessary. The above remarks are made without any regard to the word *ku-tu* ascribed to the Mo-ho in the *T'ang hui yao*; as said above, it remains to be seen whether this passage was extant in that work, as it existed in the T'ang period. If this should be the case, my opinion would require a certain modification in that we should have two Tungusian words, a *Mo-ho* word *kutu*, and a Khitan word *kutusi*; this would mean that the latter is a compound in which *kutu* is the name of the animal itself and *si* may have the significance of tooth or horn. Indeed the parallel Khitan word *tunasi* may lead one to the same view. In the present state of our meagre and inaccurate knowledge of Tungusian languages it would be "love's labor lost" to speculate on the origin and meaning of the two Khitan words; in their phonetic make-up they are Tungusian all right, though there is the possibility that they may have been adopted with the goods from a farther North-east-Asiatic tribe. But neither in Gilyak nor in Kamchadal, Koryak, Yukagir or Chukchi can I discover anything that would be comparable with them. We have to wait. The two words do not occur in Manchu.

cient remedy on a par with rhinoceros-horn, and like this one could neutralize every poison¹). We see how this belief was gradually aggrandised, if we compare the simple statement of Ch'ang Tâ with the more elaborate note of T'ao Tsung-i about a century later where *ku-tu* is wittily interpreted as the *ku* poison, and with the fanciful dream of Ts'ao Chao who simply plagiarizes a text relative to rhinoceros-horn heading it with the title *ku-tu-si*. Thus, the final outcome was that *ku-tu-si* was regarded as a substance closely akin to, or identical with, rhinoceros-horn. It is no doubt this peculiar development of beliefs in China which has imparted itself to the Arabs. If the word *chutuwo* cannot be explained from Arabic, as Prof. Wiedemann says, it would be reasonable to infer that it is derived from Chinese-Khitau *ku-tu-si*, and Turkish *hütü* would appear as the intermediary form. If this identification is correct, it is logical to conclude also that the Arabic and Turkish words refer to walrus

1) Not only in China and among the Arabs but also in Europe narwhal and walrus ivory was employed medicinally, at least as far down as the seventeenth century, as already shown above by a reference to Boetius de Boot. W. JARDINE (*The Natural History of the Ordinary Cetacea or Whales*, p. 190, Edinburgh, 1837) remarks on the former use of the narwhal-tusk in Europe: "At a time when the origin of the horns of these animals was less known, and when they were more rare than in the present day, they were considered as invaluable, and brought a high price. The physician, and still more the charlatan, employed them, and superstition converted them to its own use; for it is stated that the monks in various convents procured the *true* horn of the unicorn, endowed with unheard of powers, and far and near obtained for them the credit of curing the most inveterate diseases". It is well known that the narwhal became the unicorn of European fables and largely figures as such in the mediæval bestiaries. Dr. E. L. TROUËSSART of the Muséum d'Histoire Naturelle of Paris remarks on this subject (*Proceedings of the Zoological Society of London*, 1909, p. 200): "Le Rhinocéros blanc (*Rhinoceros simus cottoni*) est très probablement l'*Unicorne* ou *Licorne* des anciens. Ctésias (410 av. J. C.) nous apprend que, dès cette époque, on creusait dans la corne de Rhinocéros des coupes qui avaient la réputation de mettre ceux qui s'en servaient pour boire à l'abri de l'effet des poisons. C'est seulement au moyen âge que la défense de *Licorne de mer* ou Narwal (*Monodon monoceros*) fut considérée comme ayant la même propriété, et placée sur le front de la Licorne héraldique qui figure comme *support* dans les armes de la Grande-Bretagne". The passage here referred to in Ctesias will be found in *Indica Opera*, ed. Baehr, p. 254.

and narwhal ivory. And this can implicitly be inferred from the Arabic and Turkish texts: it is true beyond cavil, as shown above, in regard to the fish-teeth traded by the Bulgar and coming from the northern sea. W. REINHARDT¹) made an emphatic plea on behalf of the *chutwo* of the Arabs being nothing but rhinoceros-horn imported from India, and this is "quite indubitable" to him. But the Indian rhinoceros does not occur on any northern sea nor in any of the other localities mentioned in the Arabic and Turkish texts. The Arabs following the example of the Chinese have merely transferred to the walrus-tusks certain popular beliefs entertained regarding rhinoceros-horn. If anything in the case is quite certain, it is that rhinoceros-horn is not understood by *chutwo*. Why should the Egyptians have craved it and purchased it for a price two hundred times its value, if *chutwo* was rhinoceros-horn which they could have obtained easily and in great abundance from inner Africa? And were the Arabs themselves not familiar with the rhinoceros and its horn, called *kerkedon*? True it is that the bull in the country of the Kirgiz savors of the mammoth²). But notwithstanding mammoth ivory is not involved in this case, because the Arabs, I am inclined to believe, in the same manner as the Chinese, would call this material simply ivory, and further, because no such superstitious beliefs as come here into question exist in regard to ivory in Siberia, China, or elsewhere. The bull of the Kirgiz rests on a confusion of notions which may be accounted for in various ways. It seems to me that the Kirgiz were the mediators in the trade of *ku-tu-si* between the Chinese and the Turks, and possibly the Arabs. Naturally the Kirgiz were questioned by their neighbors

1) *Der Islam*, Vol. III, 1912, p. 184.

2) According to S. PATKANOV (*Die Irtisch-Ostjaken*, Vol. I, p. 123, St. Pet., 1897) the mammoth is called 'Earth-ox' by the North Ostyak. T'ao Hung-king compares its size with that of the water-buffalo and the taste of its flesh with that of beef; Sa Sung says that it resembles the ox (*P'in ts'ao kang mu*, Ch. 51 F, p. 10).

and customers as to the nature and origin of the article and the animal to which it belonged; naturally they knew as much about walrus and narwhal as the Chinese and the Arabs, and any explanation was therefore acceptable. As transpires in such cases, an imported word is easily understood or interpreted with a word of one's own language, and it seems to me that the foreign word *ku-tu-si* was taken by the Kirgiz or a related Turkish tribe on account of some real or alleged similarity in sound in the sense of a word of their language signifying 'bull'¹). At all events, while I strictly

1) When I incidentally refer to Djagatai *kotas* and Taranchi *kotas*, 'yak' (RADLOFF's *Versuch eines Wörterbuches der Türk-Dialekte*, Vol. II, col. 608), I simply mean to furnish an example as to how in my opinion the process might have evolved, but I do not mean to say that these actual words have been the agency instrumental in bringing about this end. The fact that the understanding of the word of a foreign language in one's own or pure misunderstanding of it will lead to fabulous speculations in regard to an animal is well proved by the Russian name of the walrus МОРЖЪ. In the Latin account of Matthias Michovius of 1517 (quoted above) it appears as *mors* (hence French and English *morse* first coined by Buffon), and the accidental similarity with Latin *mors* 'death' seems to have contributed much to the West-European notions of the formidable character of the animal, while there is no word to that effect in the Russian accounts (K. E. v. BAER, *l. c.*, p. 111). A translation of Herberstein published at Basle in 1567 describes the walrus as an animal of the size of an ox, called by the natives *Mors* or *Death*. In the historico-topographical work *De gentium septentrionalium conditionibus cet.* (Rum, 1555) the etymological joke is perpetrated to derive the word from *mordere* 'to bite': *Norvagiæ litus maximos ac grandes pisces elephantis magnitudine habet, qui morsu seu rosmari vocantur, forsitan ab asperitate mordendi sic appellati etc.* (*ibid.*, p. 112). The latinized *rosmarus* is derived from Skandinavian *rosmhvalr* (= horsewhale; Norwegian *rostungr*, Anglo-Saxon *horsewael*, Dutch *walrus*). Hence the popular names sea-horse (*cheval marin*) and sea-cow (*vache marine*; latinized *bos marinus*; the early French settlers in America used the expression *bête à la grande dent*). — G. SCHLEGEL (*T'oung Pao*, Vol. VI, 1895, p. 24) remarked: "Le Narval est bien connu des Chinois qui l'appellent *Loh-see-ma* 羅斯馬: un nom que nous n'avons pas pu identifier". Apparently this *lo-se-ma* is a regular transcription of the word *rosmarus*, and the meaning intended is walrus, and not narwhal; this Chinese word is not found in any dictionary, and if this identification is correct, it was evidently formed by a missionary or foreign scholar who translated a European treatise on zoology into Chinese. It is certainly an absurdity to say that the narwhal, an animal restricted to the arctic regions, should be well known to the Chinese (as already stated, little is known about its life even to our modern science and the only people familiar with it is the Eskimo), but it should not be forgotten that

adhere to the conclusion that Arabic *chutrow* and Turkish *hutū* like Chinese *ku-tu-si* principally denote walrus and narwhal ivory, it must be admitted that a confusion with mammoth ivory was possible, in view of the fact that it seldom was the complete tusk which was the object of trade, but prepared fragments or wrought articles.

The propagation of walrus and narwhal ivory is one of the stories of romance in the history of trade, and if not a page of great importance in the development of culture, yet a picture not devoid of a certain human touch with a grip of fascination upon our minds. The wonders of the Arctic Seas and the indomitable energy of the polar peoples far in the background, then a sudden flash of the daring exploits of the Norsemen, the steel-hard audacity of Siberian adventurers and treasure-seekers, castaway Japanese sailors adrift among the Aleutians, the Mo-ho and Khitan as receivers and distributors of the northern goods, the commerce of the Mongols uniting East and West, and the marvels of the Arctic finally landing at the foot of the Egyptian pyramids, — all this makes a little chapter of human effort and activity furnishing food for some reflection.

Schlegel found the narwhal described in the *Sai i ki* (*ibid.*, pp. 21, 23). Aside from the doubtful authenticity of this work (compare WYLIE, *Notes*, p. 192) in which Schlegel placed absolute confidence unrestricted by any sound criticism, it is questionable whether the narwhal *must* be recognized in this "fish a thousand *chang* long, spotted, having a horn at the end of its nose". The extraordinary length and the further note that it spirts forth water appearing, from a distance like colored clouds would rather be suggestive of a species of whale. It is moreover incorrect on the part of Schlegel to assert that the narwhal is generally called by the Japanese *shachihoko*; this word denotes the grampus, and the Japanese were not acquainted either with the narwhal as an animal species.

Additional Notes on Ku-tu-si.

An interesting text relative to *ku-tu-si* occurs in the *Yün yen kuo yen lu* 雲烟過眼錄, a work inserted in the *Shi wan k'uan lou ts'ung shu* of Lu Sin-yüan (compare P. PELLIOU, *B. E. F. E. O.*, Vol. IX, 1909, p. 246). My first knowledge of this passage was intimated by *Ko chi king yüan* (Ch. 33, p. 11 b) where it is quoted *in extenso* and correctly, the word being written in the style of the Yüan period 骨咄犀, whilst the edition of Lu Sin-yüan (Ch. 上, p. 17), in the first paragraph, has twice altered the syllable *ku* into *kuo* 國 but farther on has again the normal 骨; the former way of writing seems to be faulty. When first reading the text in the *Ko chi king yüan*, I was naturally struck by the mention in it of Ye Sen of the Yüan period and the date 1320, for as M. PELLIOU informs us, the *Yün yen kuo yen lu* was written by Chou Mi of the Sung¹). It was therefore reasonable to expect that we might light upon the passage in the appendix to this work compiled by T'ang Yün-mo of the Yüan, especially as the name of Ye Sen is cited in the postscript. In fact, however, it is not contained therein, but in the first chapter of the main treatise attributed to Chou Mi. May be this author was still alive in 1320; the date of his death is not ascertained. May be, as M. PELLIOU assures us that his work has come down in a somewhat bad condition, an editorial confusion of notes has come into play, a record

1) WYLIE (*Notes on Chin. Lit.*) gives three different and contradictory dates for the lifetime of this author; on p. 166: latter half of the thirteenth century; on p. 198: former part of the fourteenth century; on p. 250, he wrote "somewhere about the same date", the one previously mentioned being 1138. BRETSCHNEIDER (*Bot. Sin.*, pt. 1, p. 141, N^o. 48) makes him live: latter part of the thirteenth and beginning of the fourteenth century. According to *Se k'w...* (Ch. 141, p. 34), he lived under the Southern Sung in the thirteenth century (HIRTH in the writer's *Chinese Pottery*, p. 5).

of T'ang Yün-mo having been accredited to Chou Mi. However this may be, the account itself is of great interest and value. The first paragraph is exactly the same as the statement of the *Chokeng lu*, as given above (p. 321), and although the date of T'ang Yün-mo is not known to me, yet the reference to the year 1320 renders it obvious that T'ao Tsung-i writing in 1366 is indebted to this work for his information on *ku-tu-si*. The second paragraph runs as follows: "When Ye Sen 葉森 in the summer of the year *keng-shen* in the period Yen-yu (1320) paid a visit to his son Pi-ming 必明, (Pi-ming) brought him two knife-hilts of *ku-tu-si* 骨咄犀刀靶二, the material here under discussion. The natural designs displayed on it resembled the sugar-cakes now sold in the markets 其花紋似今市中所賣糖糕. Some have white spots, which are somewhat like the spots of cakes and pastry candied with sugar 或有白點或如嵌糖糕點. When you feel it with your hands, it emits an odor of *yen* cinnamon¹⁾; when you rub it, and it remains odorless, it is a counterfeit 以手摸之作巖桂香若摩之無香者乃偽物也."

We here have, accordingly, a precise chronological indication for the presence of *ku-tu-si* on Chinese soil in the year 1320, and we notice that the objects made from it were the same in the Mongol as in the previous Kin period, — knife-hilts, the same as is chronicled regarding the fish-teeth of the Bulgar on the Wolga in the West. On reading this passage I experimented on a walrus-tusk in the possession of my colleague Dr. Cory, the well-known zoölogist, but while we are agreed that on being rubbed it emits a certain odor, we do not feel sufficiently qualified to issue a definite statement as to the peculiar character of this odor.

1) According to BRETSCHNEIDER, *Botanicon Sinicum*, II, p. 384, *yen-kouri* is an old name of the *Olea fragrans*.

Ko chi king yüan (Ch. 33, p. 11 b) quotes a text from the *Sa* 續 *Sung mo ki wên*, apparently a continuation to the *Sung mo ki wên* by Hung Hao; the date of this appendix is not known to me. This passage is as follows: "The Khitan hold the *ku-tu-si* in esteem. The horn is not big; (it is so rare that) among numerous pieces of rhinoceros-horn there is not one (of this kind). It has never been worked into girdles [as is the case with rhinoceros-horn]. Its designs are like those in ivory, and it is yellow in color. Only knife-hilts are made from it, which are considered as priceless. Emperor T'ien Tsu¹) had made from this substance a *t'u-hu* (gloss: called in Chinese: *yao t'iao p'i* 'leather strip for the loins') fastened to and hanging down the head (?)." 契丹重骨嘴犀、犀不大、萬株犀無一、不曾作帶、紋如象牙帶黃色、止是作刀把已爲無價、天祚以此作冕飾 (gloss: 中國謂之腰條皮) 插垂頭者。

The word *t'u-hu* evidently belongs to the property of the Khitan language, but is not listed in the glossary of the *Liao shi*; it is perhaps preserved in the first element of the Gold word *tábulu*, 'girdle-pendant'²).

The word *kuo hia ma* 果下馬 figures as a Khitan word in the glossary of the *Liao shi* (Ch. 116, p. 14); the explanation given is the same as the one in the commentary to *Hou Han shu*. It occurs, for example, in *Liao shi*, Ch. 55, p. 3. It would be reasonable to expect that the word is of Korean origin; but I am unable to trace it in the Korean Dictionary published by the French Missionaries or in that of Gale.

1) The ninth and last emperor of the Liao dynasty who reigned from 1101 to 1119 and died in 1125 (GILES, *Biographical Dictionary*, p. 932). The history of his reign is recorded in *Liao shi*, Chs. 27—30.

2) W. GRUBE, *Goldisch-deutsches Wörterverzeichnis*, p. 79.

The Manchu equivalent of *hai pao* 海豹 is *huoethi* (*Yü chi se t'i ts'ing wén kien*, Ch. 31, p. 18). SACHAROW (*Manchu-Russian Dictionary*, p. 452) who writes *huoethe* explains the word as a seal with short hair of dark color with a greenish tinge.

The Ostyak word for mammoth *mî-χor* is discussed by Ö. BEKE (*Keleti Szemle*, Vol. XIII, 1912, p. 120) and compared to Wogul *mā-χar* (*mā*, 'earth,' and *χār*, 'reindeer').

On the occasion of a review of a paper by P. L. Cheikho concerning a treatise on precious stones by al-Afkānī who died in 1347/48, E. WIEDEMANN (*Mitt. d. deutschen Ges. f. Geschichte der Medizin und Naturwissenschaften*, Vol. VIII, p. 510) had already drawn attention to *al-chartūt* or *al-chutw* (rendering it by mammoth-teeth followed by an interrogation-mark) by reproducing a statement of al-Bērūnī as embodied in the work of al-Afkānī. Speaking of the fish-teeth wrought into knife-hafts, al-Bērūnī here concludes that *al-chutw* is likewise a tooth or horn; this would mean that he is convinced as to the identity of the two terms "fish-teeth" and *al-chutw*. In this place WIEDEMANN alludes also to FRÄHN's Ibn Fozzlāu (St. Pet., 1823, pp. 228—9) where according to the *Sīrat al-Mulūk* ("Chronicle of the Kings") of 1076 by the Vesīr Nizām al-Mulk Ḥasan are mentioned teeth resembling the tusks of elephants which were obtained in the country of the Bulgar then living on the Wolga, thence exported to Khiwa and there worked up into combs, capsules, etc. (compare above p. 316). It seems that in this case the mammoth cannot come into question, no mammoth having ever been found in the region of the Wolga, and that the trade in these tusks can only be connected with the walrus-teeth captured by the Russians, as shown above.

GEORG JACOB had already confronted Arabic *chutww* and Chinese-Khitau *ku-tu-si* in his treatise "Welche Handelsartikel bezogen die Araber des Mittelalters aus den nordisch-baltischen Ländern?", p. 58 (Berlin, 1891) and commented on the term in his "Die Waren beim arabisch-nordischen Verkehr im Mittelalter," p. 9 (Berlin, 1891). With correct instinct he remarks that the word *ku-tu-si* does not seem to be originally Chinese.

In the last number of *Der Islam* (Vol. IV, May, 1913, p. 163) Dr. J. RUSKA contributes a note under the title "Noch einmal al-Chutww." Wrongly assuming that it is now certain that *al-chutww* means rhinoceros-horn, he furnishes very interesting material regarding the latter, chiefly after Qazwīnī of the thirteenth century (1203–83), but without noticing that this account is copied from the report of the merchant Soleiman of 851 translated by M. REINAUD (*Relation des voyages faits par les Arabes*, Vol. I, p. 28)¹), and that the story of the rhinoceros with jointless legs occurs as early as in the *Physiologus* (Ch. XIX) where the same fable is related in regard to the elephant. This story is of particular interest to us, as a purer and more original version of it is preserved in a Chinese account. Su Sung, author of the *T'u king pên ts'ao* published by imperial order in the Sung period, in his account on the rhinoceros (*Pên ts'ao kang mu*, Ch. 51 上, p. 5 b) has the following story attributed to Wu Shi-kao 吳士皐, a physician of the T'ang period; according to the fuller version of the *Chéng léi pên ts'ao* (Ch. 17, fol. 21 b), this physician served in an official capacity

1) Also the passage translated by RUSKA from Damīn is cited by REINAUD in his notes (Vol. II, p. 69). In regard to Qazwīnī, G. JACOB (*Ein arabischer Berichtersteller aus dem 10. Jahrhundert*, p. 56, Berlin, 1896) observes that he repeatedly copies without quoting.

on the maritime coast of southern China and picked up the fable from a captain whom he encountered there. It is a real captain's story. "The maritime people intent on capturing a rhinoceros proceed by erecting on a mountain path many structures of decayed timber, something like a stable for swine or sheep. The front legs of the rhinoceros being straight without joints, the animal is in the habit of sleeping by leaning against the trunk of a tree. The rotten timber will suddenly break down, and the animal will topple in front without being able for a long time to rise. Then they attack and kill it." 唐醫吳士臯言、海人取犀先於山路多植朽木如豬羊棧、其犀前脚直常依木而息、爛木忽然折倒仆久不能起因格殺之 (*Chéng lei pén ts'ao* adds: 而取其角 "and capture its horn")¹).

The coincidence with the elephant story of the *Physiologus* is obvious. "When the elephant has fallen, he cannot rise, for his knees have no joints. But how does he fall? When he wants to sleep, he leans against a tree, and thus he sleeps. The Indians familiar with this peculiarity of the elephant saw the tree a bit. The elephant comes to lean toward it, and as he draws near to the tree, it falls to the ground, taking him with it. After falling he is not able to rise. He begins to scream. One elephant, and then twelve others arrive to help him, — in vain, until at last the small elephant appears, lays his trunk around him and lifts him"²).

1) GROENEVELDT (*T'oung Pao*, Vol. VII, 1896, p. 131), without stating his source, refers to a similar story told by the natives of Java in regard to a wild cow of diminutive size, said to live in the loneliest recesses of the jungle.

2) Compare P. LAUCHERT, *Geschichte des Physiologus*, p. 43 (Strassburg, 1889); E. PETERS, *Der griechische Physiologus und seine orientalischen Uebersetzungen*, p. 39 (Berlin, 1898); K. AHBENS, *Das Buch der Naturgegenstände*, p. 40 (Kiel, 1892); F. HOMMEL, *Die äthiopische Uebersetzung des Physiologus*, p. 89 (Leipzig, 1877), etc.

The *Physiologus* plainly refers to India as the source of the tradition, but has arbitrarily changed the rhinoceros into the elephant. The Arabic report of Soleiman and our Chinese version go to show that the story was associated in India with the rhinoceros; it would be difficult to understand also that people so intimately familiar with the elephant as those of India should have ever conceived of it with jointless knees. The fundamental value of the Chinese text lies in the fact that it mirrors the primeval form of the Indian story which served as basis to that adopted by the *Physiologus*. The Chinese story is consistent in relating the capture of the rhinoceros in consequence of the human ruse founded on the alleged anatomical quality and life-habit of the animal. The *Physiologus*, however, only tells the operation of the trick, and quite illogically, forgets the hunter waiting in ambush and has the animal rescued in a miraculous manner. This feature is due to the religious tendencies of this book in which all animal stories are subjected to a symbolic Christian interpretation. In the present case the big fallen elephant is Adam, the twelve elephants are the prophets, and the elephant coming to the rescue is Christ. Our Chinese text does not directly allude to India proper, and "the maritime people" is a somewhat vague expression hinting at the inhabitants of the southern sea, as Annam, Cambodja etc.; but the captain repeating the story to the Chinese physician of the Tang period had doubtless hailed from some southern port within the culture sphere of India, so that we may well assume that the story was diffused at that time over the Archipelago and Farther India. The version of the *Physiologus* proves that it is far older in India proper, and there are indications that it must have spread to the antique world at a time somewhat

anterior to the composition of the original *Physiologus*. It is well known that PLINY (*Nat. Hist.* VIII, 39) and CAESAR (*De bello gallico comm.* VI, 27) have similar yarns to tell about the elk whose legs are without joints, wherefore it does not lie down in sleeping, but only leans against a tree which is sawed through to trap the animal¹). As to Pliny (23—79 A.D.), F. HOMMEL²) assumes that among the Greek works ransacked by him there was also the *Physiologus*; it is not known to me whether this opinion is shared or still upheld by classical philologists. As to Caesar (B. C. 100—44), I do not venture to set forth an opinion as to the possible dependence of his story on that of the primeval *Physiologus*, but must leave this question to the decision of those competent to judge. There can be no doubt, however, of the close historical interrelation of the occidental and oriental versions of this fable, and of its localization in India confirmed by Soleiman and our Chinese text which despite its relatively recent record contains the primitive form of the story. While it must be recognized that the Greek *bestiaire* arising during the Alexandrian epoch in that curious medley of Egypto-Hellenic thought is mainly composed of Egyptian and Semitic ideas, it is covered also by a certain stratum of Indian elements deserving careful study.

1) Compare O. KELLER, *Die antike Tierwelt*, Vol. I, pp. 282, 283 (Leipzig, 1909).

2) *L. c.*, p. XXXIV.

ADDENDA

PAR

PAUL PELLIOT.

C'est à la demande de mon ami B. Laufer que je me permets d'ajouter quelques notes à son article si intéressant sur l'ivoire de morse et de narval. Je crois que M. Laufer a parfaitement établi l'identité du produit *al-chutwo* des Arabes et du *kou-tou-si* des Chinois, et mes notes ne visent qu'à préciser quelques points de détail et à faire connaître un ou deux textes nouveaux.

En premier lieu, je relève dans l'article de M. Laufer une expression qui demeure pour moi assez mystérieuse; c'est celle de 碧犀 *pi-si*, que M. Laufer traduit par « corne de rhinocéros bleu-verte » (p. 324, 325). Littéralement, tel paraît bien être le sens, mais cette expression semble avoir pris d'assez bonne heure une valeur spéciale qu'il reste à déterminer. Un examen rapide ne m'a pas fait retrouver, malheureusement, le passage du commentaire du *Chan hai king* que cite le *P'ei wen yun fou*; il devrait cependant s'agir en principe du commentaire de Kouo P'ouo, ce qui attesterait l'existence de l'expression *pi-si* au moins au début du IV^e siècle ¹⁾. Mais ce qui est bien certain, c'est qu'en chinois mandarin moderne, *pi-si* désigne une pierre précieuse et non une corne de rhinocéros. Nous avons tous vu à Pékin cette pierre rose veinée très transparente qu'on appelle *pi-si*, et pour laquelle certains lettrés, faute d'une orthographe absolument consacrée, songent à une forme 碧璽 *pi-si* à côté de 碧犀 *pi-si*. Par contre 黃碧犀 *houang pi-si*, le

1) Il ne résulte pas de la citation du *P'ei wen yun fou* que « la corne de serpent du Kou-tou » soit mentionnée dans le *Chan hai king* lui-même, comme l'admet M. Laufer.

«*pi-si* jaune», est sans aucun doute la topaze et est donné comme tel dans le dictionnaire de Giles¹⁾. Une fois de plus, nous nous apercevons ici que notre connaissance de la terminologie chinoise des pierres précieuses est encore très peu satisfaisante, et il faudra tâcher de retrouver l'expression dans les textes.

En ce qui concerne l'expression même de *kou-tou-si*, M. Laufer en a cité (p. 320) un exemple dans le chap. 96, fol. 3 v^o, du *Leao che* et a supposé qu'on devait la retrouver dans le *Kin che*. En effet, au chap. 64, fol. 2 r^o, du *Kin che*, il est question de «poignard à [manche de] *kou-tou-si* des anciens Leao» (故遼骨睹犀佩刀)²⁾.

Aux p. 340—341, je ne suis pas d'accord avec l'interprétation que propose M. Laufer pour le texte du *Kieou t'ang chou*. Le mot 納 *na* ne peut signifier ici «recevoir» et la coupure qui résulte de cette leçon est très anormale; en réalité 納 *na* doit être une simple faute d'impression pour 紬 *tch'eu*, et il n'y a, selon moi, rien à tirer directement de ce passage, où il est question d'une étoffe, pour attester qu'on ait connu en Chine l'ivoire de morse ou de narval à l'époque des T'ang.

Le *Siu song mo ki wen*, dont M. Laufer dit ne pas connaître la date (p. 358—359), est en réalité le second chapitre du *Song mo ki wen* lui-même; il est dû, lui aussi, à Hong Hao, et fut écrit en 1143 ou très peu après. Cf. à ce sujet le *Catalogue impérial*, chap. 51, fol. 19—20.

Il n'est pas douteux que le terme de 兔鶻 *t'ou-hou*, que le *Siu song mo ki wen* a fourni à M. Laufer, désigne bien une espèce de ceinture. S'il se présentait isolément, on pourrait hésiter, puisque, traduit mot-à-mot, *t'ou-hou* signifie «le faucon [qui prend] les lièvres»,

1) Cf. aussi par exemple A. Guériu, *Dialogues chinois*, un album oblong sans lieu ni date [1911], p. 73, 75.

2) On notera cette orthographe de *kou-tou-si* qui jusqu'ici ne s'est pas rencontrée ailleurs.

et tel est en réalité le nom d'un oiseau de proie qui correspond au *citalyu*, *Falco sacer*, des Turcs d'Asie centrale¹⁾. Mais la glose qui accompagne ici le nom montre bien, comme l'a vu M. Laufer, qu'il s'agit de la transcription d'un mot khitan. D'ailleurs, à côté de l'orthographe que nous avons ici, on rencontre plus souvent une autre orthographe 吐鶻 (*t'ou-hou*²⁾); le mot a désigné une ceinture, ou plutôt un pendant de ceinture, aussi bien au temps des Leao que sous les Kin.

Dans ses notes additionnelles (p. 357—358), M. Laufer a traduit un curieux texte du *Fun yen kouo yen lou* de 周密 Tcheou Mi où il est question du *kou-tou-si*, mais sur la date de ce texte, notre confrère laisse en suspens certaines questions qu'il n'est pas impossible de résoudre. M. Laufer s'étonne en effet, si Tcheou Mi est bien de la fin des Song, qu'on trouve dans son ouvrage la date de 1320. Tcheou Mi est un écrivain abondant et qui a laissé des œuvres d'un grand intérêt historique. Je ne crois donc pas inutile de serrer le problème d'un peu plus près qu'on ne l'a fait jusqu'ici.

Malgré l'importance de son œuvre, Tcheou Mi n'a pas eu les honneurs d'une biographie dans l'histoire officielle des Song. Mais, de nos jours, Lou Sin-yuan a tenté de suppléer à cette lacune en groupant dans son 宋史翼 *Song che yi* (chap. 34, fol. 2 v^o—9 r^o) les principaux renseignements qui nous sont parvenus sur ce personnage³⁾. Il en résulte que Tcheou Mi dut naître au plus tard vers 1230. En 1253—1258, il était sous-préfet de 義烏 Yi-wou, puis fut secrétaire du préfet de Hang-tcheou en 1261, inspecteur des greniers en 1274. A la chute des Song, il se retira au 癸辛街 Kouei-sin-kiai⁴⁾ de Hang-tcheou et passa le reste de sa vie à s'oc-

1) Cf. D. Ross, *A polyglott list of birds*, p. 274.

2) Par exemple dans *Leao che*, chap. 96, fol. 3 v^o; dans *Kin che*, chap. 64, fol. 2 r^o, etc.

3) Sur le *Song che yi*, cf. *B.E.F.E.-O.*, IX, 813.

4) Ainsi s'explique le titre de 癸辛雜識 *Kouei sin tsai che* donné par Tcheou Mi à un de ses principaux ouvrages.

cuper de littérature et d'archéologie. Il est pratiquement certain qu'il était mort en 1320, ou tout au moins que toutes ses œuvres, et en particulier le *Yun yen kouo yen lou*, sont antérieures à cette date. Tcheou Mi a laissé les œuvres suivantes: 1° 齊東野語 *Ts'i tong ye yu*; 2° 癸辛雜識 *Kouei sin tsa che*; 3° 志雅堂雜鈔 *Tche ya t'ang tsa tch'ao*; 4° 浩然齋雅談 *Hao jan tchai ya t'an*; 5° 浩然齋視聽鈔 *Hao jan tchai che t'ing tch'ao*; 6° 澄懷錄 *Tch'eng houai lou*; 7° 乾淳起居注 *K'ien tch'ouen k'i kiu tchou*; 8° 乾淳歲時記 *K'ien tch'ouen souei che ki*¹⁾; 9° 武林舊事 *Wou lin kieou che*; 10° 武林市肆記 *Wou lin che sseu ki*; 11° 湖山勝概 *Hou chan cheng kai*; 12° 弁陽客談 *Pien yang k'o t'an*; 13° 雲烟過眼錄 *Yun yen kouo yen lou*; 14° 絕妙好詞 *Tsiue miao hao ts'eu*. Presque toutes ces œuvres nous sont parvenues et il y en a des rééditions modernes. Selon le *元藝文志* *Yuan yi wen tche* de Ts'ien Ta-hin, qui est devenu le chap. 94 (fol. 3 v^o) du *元史新編* *Yuan che sin pien* de Wei Yuan, il faudrait encore ajouter le *蠟屐集* *La ki tsi* en 1 chapitre et le *弁山詩集* *Pien chan che tsi*, en 5 chapitres.

Mais comment expliquer alors la mention de la date de 1320? D'une manière très simple: le passage traduit par M. Laufer, ainsi qu'il résulte du texte lui-même, est une de ces additions dues à Ye Sen et dont il est question dans la notice finale. Mais à quoi rime cette addition? C'est ici qu'il faut faire intervenir le paragraphe précédant celui que M. Laufer a traduit et qui seul justifie la glose de Ye Sen. En réalité, Tcheou Mi rapporte plusieurs propos qu'il met sur le compte d'un certain 伯幾 Po-ki. L'identité de ce dernier personnage n'est pas douteuse; Po-ki, plus souvent écrit 伯機 Po-ki, est le surnom d'un calligraphe et poète de la fin du

1) C'est là l'ouvrage dont il est question dans *B.E.F.E.-O.*, IV, 288, et *k'ien-tch'ouen* y est bien un *nien-hao* de la fin des Song.

XIII^e siècle, 鮮于樞 Sien-yu Tch'ou¹⁾. C'est donc Sien-yu Tch'ou qui a tenu à Tcheou Mi le propos relatif au *kou-tou-si* qui est «la corne d'un serpent»; le passage fait bien partie de la rédaction primitive du *Yun yen kouo yen lou*. Quant au deuxième paragraphe traduit par M. Laufer, c'est une note ajoutée par Ye Sen, qui visita «son fils» Pi-ming en 1320 et vit chez lui deux manches de poignard en *kou-tou-si*. Qui est «son fils»? Mais évidemment le fils de Sien-yu Tch'ou; ce fils possédait encore en 1320 les objets dont son père avait parlé à Tcheou Mi quelque trente ans plus tôt. Quant à ce «nom» de 必明 Pi-ming, c'est certainement un surnom. Il doit s'agir en réalité de 鮮于去矜 Sien-yu K'iu-king, qui lui aussi s'acquit quelque réputation comme calligraphe. A vrai dire, le *P'ei wen tchai chou houa p'ou*²⁾ donne à Sien-yu K'iu-king le surnom de 必仁 Pi-jen et non de 必明 Pi-ming. Mais on sait qu'il y a généralement un rapport entre le nom personnel (*ming*) et le surnom (*tseu*). Or je ne vois pas comment justifier Pi-jen pour un nom personnel K'iu-king. Pi-ming s'explique bien au contraire par allusion à une phrase de Siun-tseu³⁾. Ainsi, en définitive, le

1) Sien-yu Tch'ou, *tseu* Po-ki, hao 困學 K'ouen-hio, avait laissé un 困學齋集 *K'ouen hio tchai tsi* aujourd'hui perdu. Deux morceaux écrits par lui sont incorporés au chap. 4 du 元文類 *Fuan wen lei*; d'autres se trouvent au chap. 4 (fol. 8 v^o—9 r^o) du 元詩紀事 *Yuan che ki che*; cf. aussi *P'ei wen tchai chou houa p'ou*, chap. 37, fol. 2 v^o. Les bibliographes de K'ien-long (*Catalogue impérial*, chap. 122, fol. 1 r^o et v^o) ont accepté l'attribution à Sien-yu Tch'ou d'un 困學齋雜錄 *K'ouen hio tchai tsa lou*, proposée par 曹溶 Ts'ao Jong dans une notice finale de 1682. D'après ces bibliographes, Ts'ao Jong avait incorporé l'ouvrage à son 學海類編 *Hio hai lei pien* (sur cette collection, cf. *Catalogue impérial*, chap. 134, fol. 21 v^o—22 v^o); mais le *Hio hai lei pien* est resté longtemps manuscrit, et l'édition en caractères mobiles qui en a été donnée en 1831 ne contient pas le *K'ouen hio tchai tsa lou*; par contre, cet opuscule se trouve dans le *Tche pou tsou tchai ts'ong chou*; un passage me paraît gêner l'attribution à Sien-yu Tch'ou

2) Chap. 37, fol. 2 v^o.

3) 有兼聽之明而無舊矜之容.

passage du *Yun yen kouo yen lou* traduit par M. Laufer nous aurait conservé la forme véritable d'un surnom qui a été altéré dans la source du *P'ei wen tchai chou houa p'ou*. Quant au texte essentiel relatif au *kou-tou-si*, celui qui a ensuite passé en 1966 dans le *Tcho keng lou*, il est bien de Tcheou Mi lui-même et se place dans les dernières années du XIII^e siècle.

Dernières additions. P. 355. — Sur *lo-sseu-ma*, cf. encore *T'oung Pao*, V, 1894, p. 370. Il faudrait rechercher si le terme se retrouve réellement dans le 正字通 *Tcheng tseu t'ong*, comme le dit Schlegel; en tout cas, les «deux cornes recourbées» prouvent bien qu'il s'agit du morse et non du narval. [B. L.]

P. 340—341 et p. 359. — Sur *yu-ya-tch'ou* et sur *kouo-hia-ma*, cf. Courant, dans *T'oung Pao*, IX, 1898, p. 15 et 16. [B. L.]

SUPPLEMENTARY NOTES ON WALRUS AND NARWHAL IVORY.

BY

BERTHOLD LAUFER.

The following notes are intended to supplement my essay published in *T'oung Pao*, 1913 (pp. 315—364), and accompanied by additional notes of M. PELLIOU (pp. 365—370).¹ Page references given without further specification pertain to that article.

¹ These notes were written in the beginning of 1914, but their publication has been delayed owing to circumstances beyond the writer's control. I avail myself of this opportunity to express to my esteemed friend, M. Pelliot, my sincere thanks for his generous co-operation and his valuable additional notes. The present article contains also several interesting contributions from his pen. — Further bibliographical references may find place here. The *T'u shu tsi ch'êng*, following the procedure of Li Shi-chên, has placed that author's text on *ku-tu-si* in the section on "Snakes" (XIX, 181, *kuai k'ao* II, p. 15), without adding any further matter, while the text of the *Yün yen kuo yen lu* is inserted among the miscellaneous notes on the "Rhinoceros" (XIX, 69, *tsa lu*, p. 3). This shows that no scholarly investigation of the subject was made in the Manchu period. Likewise it is worthy of note that the editors of the great cyclopædia, in the same manner as Li Shi-chên, overlooked the fundamental definition of the term *ku-tu-si* in the *Liao shi*, and its employment in the Annals of the Liao and Kin Dynasties. This, as well as other instances, bears out the fact that the encyclopedic works of the Chinese, with all their vast accumulation of material, are far from being complete or perfect. — The passage quoted on p. 327, note 1, after *P'ei wên yün fu*, is in *T'ang shu*, Ch. 40, p. 8 b; also in *Ta t'ang leu tien* 大唐六典, Ch. 3, p. 6 b (ed. of *Kuang ya shu kü*, 1895). — Ohtere's account (p. 337) is easily accessible in H. SWEET's *Anglo-Saxon Reader* (pp. 17—23, Oxford, 1908); and in English translation in C. R. BRADLEY, *Texts and Versions of Carpini and Rubruguis* (p. 8, London, Hakluyt Society, 1903)

In regard to the modern trade with China in marine ivory, S. WELLS WILLIAMS¹ had stated,—

“Seahorse teeth, 海馬牙 *hai ma ya*,² are brought from California, Sitka, and other parts of western America, and are used by the Chinese in the same manner as ivory. Under this term are also included the teeth and tusks of the walrus, sperm whale, and other cetaceous and phocine animals; but with the cessation of the whale fishery, the importation has dwindled to almost nothing.”

On September 6, 1913, the “Daily Consular Trade Reports” published by the Department of Commerce and Labor of Washington contained the following, written by Consul-General F. D. CHESHIRE, Canton (p. 1356):

¹ *Chinese Commercial Guide*, 5th ed., p. 102 (Hongkong, 1863).

² The adoption of the word *hai ma* in the sense of “walrus” seems to be of recent origin. The Manchu word corresponding in sense to Chinese *hai ma* or given as its equivalent in the Manchu-Chinese dictionaries is *malta* which, judging from the native definitions, seems to denote a kind of seal (see AMIOT, *Eloge de la ville de Moukden*, p. 289, Paris, 1770; and SACHAROV, *Manchu-Russian Dictionary*, p. 872). The *Polyglot Dictionary* of K'ien-lung (Ch. 32, p. 47) adds to this equation Tibetan *mts'o srin* and Mongol *aramana*. A. КИРХЕР (*La Chine illustrée*, p. 259, Amsterdam, 1670) figures a (somewhat grotesque) hippopotamus with the legend “L'Hippopotame ou Cheval-Marin appelé Hayme par les Siriens.” On the cut we read *hai ma*, accompanied by Chinese characters. Kircher gives a somewhat confused description of the animal after Boim, who asserts that the Chinese make chaplets, crosses, and images of saints from its teeth, “et on assure qu'il n'y a rien de si salutaire pour empêcher le flux de sang, que de porter quelqu'une de ses pieces sur soy.” See also O. DAPPER, *Beschryving des Keizerryks van Taising of Sina*, p. 241 (Amsterdam, 1670). The ancient authors, however, understand by the term *hai ma* a kind of shrimp (蝦類) having the shape of a horse, — according to Ch'ên Ts'ang-k'i of the T'ang period five to six inches long, according to K'ou Tsung-shi of the Sung period two to three inches long, — and occurring in the southern sea (*T'u shu tsi ch'êng*, XIX, 164). The Chinese naturalists seem to be ignorant of the term *hai ma*, as applied by the archæologists with reference to the lion-like animals displayed on a certain class of metal mirrors. — The word “sea-horse” was used in English in the same sense. The *Century Dictionary* credits it with the meaning “morse of walrus”, and gives sea-horse tooth as “the ivory-yielding tooth of the walrus or of the hippopotamus.” The famous English naturalist John Ray (1627—1705), who wrote under the Latinized name Raius, has the following observation in his work *Synopsis methodica animalium quadrupedum* (p. 193, Londini, 1693): “Vidi etiam penem eiusdem animalis [i. e. rosmari, walrus] osseum rotundum, cubitum et amplius longum, crassum, ponderosum ac solidum, in fine prope glandem longe crassiorem et rotundiorem. Huius pulvere ad pellendum calculum Moscovitæ utuntur. Dentes hi nostratibus Equi marini dentes *Sea-horses Teeth* appellantur.”

"Before the revolution, about eighteen months ago, there was considerable trade in the manufacture from walrus ivory tusks of tobacco-pipe mouth-pieces, handles of fans, thumb-rings, and peacock-feather tubes for mandarin hats. These articles were sent to Peking, where they were dyed a green color, resembling the color of jade, but since the revolution there has been very little activity in the manufacture of such goods from walrus tusks. The demand has fallen off considerably, and the trade is confined to making cigarette holders, tooth brushes, and chopsticks. The value of walrus tusks is \$ 280 to \$ 400 Hongkong currency per picul (133½ pounds). Elephant tusks are worth \$ 700 to \$ 1,200 Hongkong currency per picul. The elephant tusks are more serviceable and at the same time more valuable."

On the same page, Consul-General G. E. ANDERSON, Hongkong, reports that inquiry among local importing and exporting firms and dealers in ivory of Hongkong failed to locate any importations of walrus ivory, but that elephant ivory is imported in large quantities, and is shipped mostly to Canton.

An inquiry regarding the trade in walrus and narwhal ivory from Alaska, addressed to the Department of Commerce and Labor, Washington, elicited the information that during the fiscal year 1913 a quantity of ivory, and manufactures thereof, amounting to \$ 2,475, was received from Alaska, but that no figures were known there concerning the export of these articles to China. It was therefore intimated to me to communicate with the United States collectors of customs at Juneau (Alaska), San Francisco (California), and Seattle (Washington) for further information. The collector of customs, San Francisco, wrote as follows:—

"There are no statistics kept at this office, from which the desired information can be furnished. I have made several inquiries regarding this matter, but can find no one that can furnish the requested information."

The collector of customs, Seattle, reported,—

"I regret to advise you that no record is kept by this office of the ivory, or other products, received in this District from Alaska."

The following positive information was received from the collector of customs, Juneau, Alaska:—

"TREASURY DEPARTMENT,
UNITED STATES CUSTOMS SERVICE,
PORT OF JUNEAU, ALASKA,
December 15, 1913.

"Replying to your letter of the first instant relative to exportation from this district of walrus and narwhal ivory, I have to state that there was during the present year exported direct from Alaska to China 4,000 lbs. of walrus ivory, value \$1,200, and from Alaska to the United States 7,763 lbs. of foreign walrus ivory, value \$2,717. The destination of the latter quantity is unknown to this office, but it is believed that the bulk of this ivory is exported to Japan and China."

To a further inquiry as to the route or line upon which direct exportation of ivory from Alaska to China is undertaken, the collector of customs of Juneau was good enough to reply on January 20, 1914, that this shipment was made by the Norwegian tramp steamer "Kit" from Nome to Japan, that there is no regular transportation line direct from the Alaskan coast to the Orient, but that occasionally tramp steamers call at different ports, bound for the Orient.

As the fact of a direct Alaskan-Chinese ivory trade was now established, and as, according to the report of our Consul-General at Canton, the material is handled and wrought there by the Chinese, it seemed to me an essential point to inquire if the ancient name *ku-tu-si* is still known to the Cantonese. The Consul-General of Canton, in a letter of January 16, 1914, favored me with the following reply:—

"I beg to state that I have made many inquiries, and find that the name by which walrus ivory is commonly known in Canton is *hai ma ya* 海馬牙. The term for walrus ivory which you state in your paper was common in ancient Chinese literature,—*ku-tu-si*,—I find is not known or used at present in Canton."

Simultaneously my old friend P. P. SCHMIDT, Professor of the Chinese language at the Oriental Institute of Vladivostok, whom I had interested in the problem because of the importation of walrus ivory from Gishiginsk and Baron Korff's Bay to that port (p. 335), was good enough to send me the following note:—

“The word *ku-tu-si* is not known here. The tusks are called in Chinese *hai ma ya* 海馬牙, in Japanese *kaiba no kiba*.¹ In Korean the walrus is styled *yōng sē* 靈犀 (Chinese *ling si*). Since 1909 the firm Tshurin has taken the northern trade into its hands, and annually receives from forty to fifty *pud* of walrus ivory, which is transported via Moscow to London. This article was formerly handled by a merchant from St. Petersburg. It has always been disposed of, however, in London, not in China, Japan, or Russia. The bulk of walrus ivory is collected by American smugglers, and exchanged for alcohol. Such a ship has recently brought together

¹ This means likewise “sea-horse teeth.” *Kai-ba* is the Sino-Japanese reading of *hai ma*. The Japanese dictionaries of Hepburn, Gubbins, Nitobe and Takakusu, also assign to *kai-ba* the meaning “walrus.” Among the temple treasures of Nikkō, Japan, a narwhal-tooth is still preserved in the temple of Iyemitsu. It is figured in the little guidebook *Nikkō-zan rin-ō-ji gio-hūmotsu zu-kai* 日光山輪王寺御寶物圖解 (p. 5, Tokyo, 1896). Here we find the Portuguese name *unikōrn* (p. 349) written in Kana ヲニカウコ (Portuguese *unicorne*, *unicornio*); and the rectangular box in which the tusk is kept is inscribed with the words *Ban-kaku is-shi* 蠻角一枝, “a horn of the Barbarians,” *Ban* (Chinese *Man*) being a Japanese designation of Europeans, in particular of Portuguese and Hollanders. Dr. O. Nachod writes me that according to *Gwai kō shi kō* (p. 706) Holland presented this tusk in 1671. J. DAUTREMER (*Nikkō passé et présent, guide historique*, p. 103, Tokyo, 1894), in an enumeration of the treasures, terms it “une dent d'espadon;” but the illustration mentioned leaves no doubt that it is a narwhal-tusk. — An interesting allusion to the trade of the Dutch in narwhal ivory to Japan is contained in the work of CH. P. THUNBERG (*Voyage en Afrique et en Asie, principalement au Japon, pendant les années 1770—1779*, traduit du suédois, p. 296, Paris, 1794), who has the following: “Aussitôt que les marchandises qui composent la cargaison des vaisseaux hollandais, sont déposées dans les magasins de la Compagnie, le gouverneur fait annoncer cette nouvelle aux négocians qui se rendent alors chez lui, pour examiner les échantillons des marchandises dont la vente se fait dans un encan public, ou Kambang. Les offres se font en Mas, dont dix font un Thail. La corne de Narval se payait cette année assez cher; c'était autrefois un objet de contrebande sur lequel les Hollandais gagnaient immensément; les Japonais qui attribuent à cette production animale, semblable à l'ivoire, toutes les vertus médicinales que les adeptes vantent de la pierre philosophale, la payaient à des prix exorbitans.”

about three hundred walruses. It is not known here where this merchandise is sold. Japanese smugglers have not been noticed in the high north among the Chukchi. This is all I am able to learn here."

The term *ku-tu-si*, accordingly, is now extinct in China, and this is exactly what we should expect; and S. Wells Williams was correct in applying the term *hai ma ya* to walrus ivory.

G. CAHEN¹ calls our attention to the fact that in the first part of the eighteenth century the Russians bartered with the Chinese two articles,—seal-skins and walrus-tusks, called "bones of the walrus-tooth" (кости моржевого зуба). The Russians, consequently, appear twice in the history of this trade with China,—first in the Mongol period, when Russian walrus ivory, through the medium of the Mongols, reached Turkistan (p. 338); and again in recent times, as direct traders of the article in northern China.

The *Pa hung yi shi* (p. 321), the preface of which is dated 1683, has the following account of Russia (Ch. 2, p. 1 b): "Russia 阿路索² is situated north-west from China, and in the north-east of Europe. The country has walled cities. As to apparel, sable coats are most highly esteemed. Men and women themselves settle their marriage affairs. They live in blockhouses. Vassal states are numerous. The population is sparse compared with the extent of the area. The climate is exceedingly cold, and the soil of the far-off corners is frozen up during six months. During the Ming dynasty no intercourse was as yet established with China. It was only at the time of K'ang-hi of the present dynasty that they first presented black sables 黑貂, fish-teeth 魚牙, gyr-falcons 海青,³

¹ *Le Livre de Comptes de la caravane russe à Pékin en 1727—1728*, p. 104, note 1 (Paris, 1911). M. Cahen's statement is based on L. Lang, *Journal de la résidence du sieur Lange, agent de sa Majesté impériale de la Grande Russie à la cour de Chine dans les années 1721 et 1722* (Leiden, 1726); LANG speaks of "les dents de lous-marins."

² BRETSCHNEIDER, *Medieval Researches*, Vol. II, p. 71.

³ In the *Polyglot Dictionary* (Ch. 30, p. 10) this term corresponds to Tibetan *k'ra. d'en*, Mongol *songkor*, Manchu *songkom* (see also AMIOT, *Éloge de Moukden*, p. 265).

a striking-clock, glass mirrors, and other objects. The speech of this people differs from the other languages of Europe, but as to writing they use the European letters. The western scholar 西儒 Nan Huai-jên 南懷仁¹ understood their language."

Since the Russians styled walrus-tusks "fish-teeth" (p. 337), and, according to their own documents, imported them into China during the K'ang-hi period (1662-1722), the fact is established that the term *yū ya* 魚牙 of the Chinese text quoted refers to walrus-tusks. It was not that Russian influence of recent date, however, which caused this Chinese phrase to assume this specific meaning. Prior to the arrival of the Russians, the expression existed, and is clearly enough defined to leave no doubt that it denotes marine ivory. The *Wu li siao shi* (p. 328), Ch. 8, p. 21, speaking of wrought objects of elephant ivory 象牙器, has a notice to this effect: "That kind of ivory styled *shu kio* [p. 343, note] is marine ivory (or the tooth of the sea-elephant).² The tooth of the red boar is in color like oysters and jujubes, and is veined like elephant ivory. The fish-teeth are like elephant's teeth" (其曰殊角者海象牙也。紅猪牙如蚌棗色如象牙紋。魚牙如象齒). It is unambiguously expressed in this passage that "fish-

E. D. Ross (*Polyglot List of Birds*, No. 68) is quite right in assigning to it the meaning "gyr-falcon," which, by the way, had already been established by W. SCHOTT (*Über die üchten Kirgizen*, *A.B.A.W.*, 1865, p. 449). The Russian name is кречеть. S. VON HERBERSTEIN (*Rerum Moscoviticarum Commentarii*, translated by R. H. MAJOR, Hakluyt Society, 1852, Vol. II, p. 35) emphasizes the large number of gyr-falcons in Muscovy, trained for taking swans, cranes, and other birds of that kind.

¹ Ferdinand Verbiest (1623-88).

² D. CRANTZ (*History of Greenland*, Vol. I, p. 125, London, 1767) describes the walrus under the name "sea-cow" (adding German *wallross*, Latin *rosmarus*, and French *vache marine*), saying, "Their bodies resemble a seal, but their heads are very different; for the head of this is not long, but stubbed and broad, and therefore it might be called a sea-lion, or perhaps elephant, on account of the two long tusks it has." The *Persian-English Dictionary* by JOHNSON and RICHARDSON (ed. STEINGASS, p. 945) quotes *fīli daryū* دریا فیلی "sea-elephant" as a name for walrus.

teeth" are a product of the nature of ivory; and for this reason I am disposed to conclude also that the "fish-tooth silks" mentioned in the T'ang Annals as tribute of Sinra and the Mo-ho (pp. 338 – 342) ¹ were so named from peculiar patterns woven in these stuffs, and resembling the natural designs occurring in walrus ivory. In fact, nothing else could be intended by this expression. Such designs as might be imitated in textiles are peculiar to walrus ivory, and to this kind of ivory only, which in its cross-sections exhibits designs of the character of grained wood, and along the sides is intersected by fine yellow lines, or overstrewn with larger yellow flamed spots.

In 1518 the prince of T'ien-fang (Arabia), Sie-yi-pa-la-k'o 寫亦把刺克, sent an envoy to the Chinese Court offering as tribute horses, camels, knives made of fish-teeth 魚牙刀, and other objects; and he received for his sovereign precious garments, silk-stuffs, musk, etc. ²

It is by no means striking that the term 魚牙 "fish-tooth" assumed the specific significance of "walrus-tooth." This development is quite in harmony with the genius of the Chinese language. From remote times the word yü 魚 has denoted not only "fish," but also "sea-mammals." In the *Shi king* (II, 1, VII, 6; and II, III, IV, 1) ³ we find twice the compound yü fu 魚服 rendered

¹ M. PELLLOT (p. 366) is doubtless correct in assuming that 納 in the text of the *Kiu T'ang shu* is a misprint for 紬 (this reading, indeed, is given in the *Pien tse lei pien*, Ch. 221, p. 1 b); this emendation, however, does not affect my conclusion. In the *T'ang hui yao* 唐會要 (Ch. 95, pp. 16 b, 17 b; ed. of *Kiang-su shu kü*) 納 appears twice after yü ya. A curious passage extracted from a Manchu work by AMIOT (*Éloge de Moukden*, p. 290) deserves mention in this connection: "Le *lekerhi* eat un animal aquatique, dont la peau blanche et noire ressemble à une très belle étoffe." The Manchu word *lekerhi* refers to a marine mammal.

² According to the Annals of the Ming Dynasty, as already indicated by BRETSCHNEIDER (*China Review*, Vol. V, 1876, p. 173), without explaining what these knives are.

³ LEUGE, *Chinese Classics*, Vol. IV, pp. 261, 285; S. COUVREUR, *Chou king*, p. 186.

by LEGGE "seal-skin quiver," and by COUVREUR "carquois de peau de veau marin" (*phocae pellis* in his Latin translation). The word "fish" in this instance is explained by Lu Ki 陸璣 (of the T'ang dynasty) as "the name of an animal like a pig, found in the eastern sea, spotted on the back and dark (純青) underneath."¹ Medhurst identifies it with a seal; Legge is inclined to think that a porpoise may be meant. If we remember that the Gilyak, Ainu, and other North-Pacific tribes, still turn out quivers of seal-skin, we move on the basis of reality. Elephant ivory was perfectly well known in the early days of Chinese antiquity: combs of ivory 象之梳 are twice alluded to in the *Shi king*,² and the ends of the bow were tipped with ivory 象弭.³ In the *Shu king* (Tribute of Yü) ivory is simply designated as "teeth" (ch'i 齒),⁴ and in the same manner the word is employed in the *Chou li*.⁵ As the word *ya* enters into the compound *siang ya* 象牙 "elephant's tooth," the conditions were given in the language that *yü ya*, as used in the T'ang period, could easily assume the significance "tooth or ivory of a sea-mammal." A fresh impetus was received during the Mongol period, when walrus-tusks were transmitted to the Mongols by the Russians under the name "fish-teeth," and when the latter designation with its specific meaning, no doubt under Russian influence, was revived in the East. There is a piece of evidence to this effect in the tradition of the Mongols.

The Armenian King Haithon, who reigned 1224-69 and died

¹ *Mao shi ts'ao mu ch'ang yü shu*, Ch. 7, p. 9 (ed. of *T'ang Sung ts'ung shu*). Under the category "fish" a marine mammal styled *kien-t'ung* 建同 and occurring around the littoral of Cambodia is described in the *Sui shu* (Ch. 82, p. 3 b).

² LEGGE, *l. c.*, pp. 77, 164.

³ LEGGE, *l. c.*, p. 261.

⁴ LEGGE, *Chinese Classics*, Vol. III, pp. 111, 115; COUVREUR, *Chou king*, pp. 71, 73.

It must be noted, however, that *ya* 牙 properly means "canine tooth," "tusk," and *ch'i* 齒 "front or molar tooth."

⁵ HIRTH, *Ancient History of China*, p. 121.

in 1271, in the narrative of his journey to the Mongols written by Kirakos of Gandsak,¹ "told many marvelous things about the barbarous peoples whom he had seen and heard." "He asserted that beyond Cathay there was a country where the women have human shape and are endowed with reason, and where the men are without reason, big and hairy. These dogs do not allow anybody to penetrate into their territory, they go a hunting and subsist, together with the women, on the game which they seize. From the union of the dogs with the women are born boys having the shape of dogs, and girls of the shape of women. There is also a sandy island there where is found a precious bone in the form of a tree, called fish-tooth (*dent de poisson*). When it is cut, another bone will shoot forth at the same spot, in the manner of deer's antlers."² As shown by KLAPROTH, who was the first to make this document known, the fable of the Country of Dogs was generally known among the Mongols in the thirteenth century. As to the Chinese sources of the story, KLAPROTH refers only to *San ts'ai t'u lui*,³ but, as is well known, the earliest records of it are contained in the *Liang shu* (Ch. 54, p. 12), *Nan shi* (Ch. 79, p. 3 b), and *Wu Tai shi* (Ch. 73, p. 4).⁴ Haithon's story closely approaches these Chinese traditions. We dwell here merely on the point which

¹ BRETSCHNEIDER, *Medieval Researches*, Vol. I, p. 164.

² KLAPROTH, *Journal asiatique*, 1833, p. 288; and DULAURIER, *ibid.*, 1858, p. 472. Neither of these authors explains what the fish-tooth is.

³ The passage is translated, with a reproduction of the illustration, also by F. DE MÉLY (*Revue archéologique*, Vol. III, 1897, p. 359).

⁴ Compare W. W. ROCKHILL, *Journey of William of Rubruck*, pp. 12, 36; C. R. BEAZLEY, *Texts and Versions of John de Plano Carpini*, p. 117; and chiefly G. SCHLEGEL (*T'oung Pao*, Vol. III, 1892, pp. 495 *et seq.*), who has made a special study of this legend, but has overlooked the fact that the substance of the story must have been borrowed by the Chinese from western sources, and that it is only localized by them on the far-off islands in the north-eastern ocean. From this point of view the subject has been treated by me in a preliminary article published in the Anniversary Volume in honor of E. Kuhn. See, further, CHAVANNES, *Journal asiatique*, 1897, mai-juin, p. 408.

is of interest with reference to our subject. The Country of the Dogs or Dog-Headed (*kou kuo* 狗國) is vaguely defined as an island in the eastern ocean;¹ the Kingdom of Women (*nü kuo* 女國), which must be identical with it, is first mentioned in the *Hou Han shu* (Ch. 115, p. 4 b) as situated in the ocean off the coast of Korea, and is stated by the çramaṇa Huei Shên 慧深 to be distant a thousand *li* east from the country of Fu-sang 扶桑; while Fu-sang was alleged to be twenty thousand *li* east of Ta-han 大漢, the latter over five thousand *li* east of Wên-shên 文身, and Wên-shên over seven thousand *li* north-east of Japan. All this, of course, is not real geography, but geographical myth and literary reconstruction, in which a curious medley of Taoist speculations is blended with western fables and possibly with a certain substratum of traditions coming down from the tribes of the North-Pacific area, and presumably conveyed through the medium of Japanese and Chinese mariners. Haithon's country of dog-headed men with women of human shape, in the belief of the Chinese, was located in an island of the northern Pacific; and there, according to Haithon, was the home of the fish-tooth. This feature of the story, as far as I know, has not yet been pointed out in any Chinese version; but doubtless Haithon appears to have received the report from the Mongols, who, on their part, had picked it up from the Chinese. There is no other possibility than that Haithon's fish-tooth relates to walrus and narwhal tusks.² The origin of the

¹ According to the *Wu Tai shi* (*l. c.*), it was situated on the mainland north of the Shi-wei 室韋.

² The northern Woman Country has another curious relation to marine mammals. In the *Tu yang tsa pien* 杜陽雜編 (Ch. F, p. 15, ed. of *Pai kai*) we read that "in the period Ta-chung 大中 (847—860) the Woman Kingdom 女王國 sent as tribute whale-blubber stuffs 龍油綾 and seal-blubber stuffs 魚油錦 with very queer, manicolored patters; when placed in water, they did not become wet,

legend of the fish-tooth growing in the manner of trees is not far to seek, and is implied by Haithou's own words. The tusk, as previously demonstrated, was regarded as a horn; and as the stag sheds his antlers, so also the "horns" of the marine mammals were believed to become detached from the animal, and to grow again.

The fact that the notion of the tree-like character of the horn is not a personal fancy of Haithou, but a tradition which really obtained in the East, is well attested by the peculiar Khitan writing of the word *ku-tu* 楛櫛, where the classifier "tree" appears in either element. It will be seen below that the earliest writing of this word, as it occurs in the T'ang Annals, is 骨髓, where the first element *ku* ("bone"), and the use of the classifier "bone" in the second element, very appropriately indicate a product consisting of bone or ivory. The tradition of *ku-tu* being in structure or appearance like wood seems to have originated in the Liao period, and, as demonstrated by Haithou, was perpetuated down to the age of the Mongols. Nevertheless the writing of the word *ku-tu* with the classifier "tree" is a peculiar characteristic of the Liao only,

the cause thereof being attributed to the whale and seal-blubber (皆入水不濡 濕云有龍油魚油故也); the best were made in the Woman Kingdom." What Woman Kingdom is meant here, follows from the comment added, which refers us to the chapter on the "Eastern Barbarians" in the *Hou Han shu* (Ch. 115, p. 4 b) as saying that in the ocean there is the Woman Kingdom, in which the women become pregnant by looking into a well. This passage contains a curious reference to the blubber of marine animals, in this case utilized to render certain kinds of textiles water-proof. The earliest allusion to seal-blubber is made in the *Shi ki* (CHAVANNES, *Mémoires historiques de Se-ma Ts'ien*, Vol. II, p. 195), where torches or lamps fed by the grease of "the human fish" (p. 351) in the tomb of Ts'in Shi Huang-ti are mentioned. The employment of seal-blubber (海牛脂) for purposes of illumination in Shan-tung is recorded as early as the fifth century in the *Ts'i ti chi* 齊地志 of Fu Ch'ên 伏琛. With the exception of this single reference, Li Shi-chên does not speak about blubber. Chao Hio-min, in his *Pén ts'ao kang mu shi i* (p. 326; Ch. 9, p. 11), points to this omission, and devotes a brief notice to *hai kou yu* 海狗油 "seal-blubber," describing the life of the animals and the mode of their capture off the coast of Shan-tung.

and was abandoned by the Kin (p. 366) as well as by the Mongols (p. 320). Under the word *ku* 楛 the Dictionary of K'ang-hi cites the *T'u king pén ts'uo* of the Sung period to the effect that this word refers to the trunk of a tree which is white like bone, and hence receives its name, and that the southerners make from it very fine utensils. The term *ku-tu* does not relate to any specific tree, but denotes the burls or knotty excrescences on the trunks of various trees which in diverse parts of the world, owing to their fine veneer, are chosen with a predilection for carvings, particularly of bowls. Every one who has been in China has observed these fist-like knots on the mulberry-trees, called *sang ku-tu* 桑楛 榘, which, according to *Pén ts'ao kang mu shi i* (Ch. 6, p. 36), are employed as a remedy for pleurisy (治膈症). The most clever artists in burl-carved work known to me are the Tibetans, whose eating-bowls justly evoke also the admiration of the Chinese. The burls used by them, as was established by the botanist J. D. HOOKER,¹ are produced on the roots of oaks, maples, and other mountain-forest trees, by a parasitical plant known as *balanophora*. These bowls have two peculiar features in common with *ku-tu-si*: many of them are white and yellow, and, with their peculiar veins, offer a somewhat ivory-like appearance; and some of them are believed by the Tibetans to be capable of detecting poison.² This observation may possibly account for some Chinese writers ascribing *ku-tu-si* to Tibet (pp. 320—321) by confounding the ivory *ku-tu* with the vegetal *ku-tu* 楛 榘. On the other hand, we thus obtain a clue as to the reasoning of the Khitau in choosing the latter characters for the purpose of writing the *ku-tu* 骨 髓 of the T'ang.

The account of S. VON HERBERSTEIN (p. 337),³ who was am-

¹ *Himalayan Journals*, p. 91 (London, 1893).

² HOOKER, *l. c.*, p. 90; ROCKHILL, *J.R.A.S.*, 1891, p. 274.

³ *Notes upon Russia: being a Translation of the Earliest Account of that Country*,

bassador to the Grand Prince Vasiliy Ivanovich in the years 1517 and 1526, is as follows: "The articles of merchandise which are exported from Russia . . . into Lithuania and Turkey are leather, skins, and the long white teeth of animals which they call *mors*, and which inhabit the northern ocean, out of which the Turks are accustomed very skilfully to make the handles of daggers; our people think they are the teeth of fish, and call them so." "The ocean which lies about the mouths of the river Petchora, to the right of the mouths of the Dwina, is said to contain animals of great size. Amongst others, there is one animal of the size of an ox, which the people of the country call *mors*. It has short feet, like those of a beaver; a chest rather broad and deep compared to the rest of its body; and two tusks in the upper jaw protruding to a considerable length. . . . The hunters pursue these animals only for the tusks, of which the Russians, the Tartars, and especially the Turks, skilfully make handles for their swords and daggers, rather for ornament than for inflicting a heavier blow, as has been incorrectly stated. These tusks are sold by weight, and are described as fishes' teeth." Von Herberstein, accordingly, identifies the commercial label "fish-teeth" with the zoölogical term "morse;" that is, the walrus.¹

entitled *Rerum Moscoviticarum Commentarii*, translated by R. H. MAJOR, Vol. I, p. 112; Vol. II, p. 111 (Hakluyt Society, 1851, 1852).

¹ The origin of the Russian word *morž* (моржъ) is still obscure. Certain it is that it is not Slavic (Polish *mors* is derived from French *morse*), but its source is not yet traced. The derivation from Russian *mora* (море), "sea," as given in the *Century Dictionary* (see *morse*), is impossible. The relation to Lapp *morša*, *moršša*, and Finnish *mursu*, is not clear (E. BERNEKER, *Slavisches etymol. Wörterb.*, Vol. II, p. 80). The chances are that these may be based upon the Russian words as well. No lesser Finnish scholar than LÖNNROT (*Finskt-Svenskt Lexicon*, Vol. I, p. 1094) traces Finnish *mursu* to Russian *morž*; and KNUD LERM (*Lexicon lapponicum*, Vol. I, p. 925, Nidrosiae, 1758; and *Beskrivelse over Finmarkens Lapper*, p. 216, Copenhagen, 1767) records the Lapp word only in the form *morsh*, which would thus point to a Russian source. R. MECKELEIN (*Finnisch-Ugrische Elemente im Russischen*, 1914) does not cite the word *morž* among the Finno-Ugrian

A most interesting reference to the employment on the part of the Turks of knife-hilts of walrus ivory is made in 1553 by PIERRE BELON¹ as follows: "Les Turcs sont quasi aussi grande despense en leur endroit en l'orfeuerie, que nous: et ce qu'ils font, est de fort bonne matiere. Ils aiment à porter des anneaux, et veulent que leurs cousteaux soyēt bien façonnez: et les pendent à vne chaine d'argent, dont la gaine est enrichie de quelques belles garnitures d'or ou d'argēt. C'est vne coustume commune aux Turcs comme aux Grecs de porter les cousteaux aux pendants à la ceinture: et sont cōmunement forgez en Hongrie, ayants le mèche moult long: mais quand les merciers de Turquie les ont achetez, lors ils les baillent aux ouuriers pour leur mettre vn bout, qui est communement de dent de Rohart,² dont y en à de deux sortes. L'vue

loan-words in Russian. Other Finno-Ugrian and the Samoyed languages have different words; for instance, Ostyak *peñk-voi*, "tooth-animal" = walrus (A. AHLQUIST, *Sprache der Nord-Ostjaken*, p. 120), and Samoyed *teuote, tiutei* (CASTRÉN, *Wörterverzeichnis*, pp. 27, 300; regarding the Samoyed's relation to the walrus see V. KRISTININ in Klaproth's *Magasin asiatique*, Vol. II, pp. 56, 74, 76). According to the new *Oxford English Dictionary* the earliest occurrences of the word *morse* in English literature are in CAXTON, *Chron. Eng.* of 1482 ("This yere were take four grete fishes between Erethe and london, that one was callyd mors marine") and in CHANCELOUR (circa 1553) in Hakluyt's *Voyages* of 1599 ("There are also a fishes teeth, which fish is called a Morse"). — It may be added that according to Dal' "morse-eaters" (моржеѣды) is a nickname for the inhabitants of Archangel, and that *porozybъ* ("horn-tooth") is a synonyme of the narwhal.

¹ *Les Observations de plusieurs singularitez et choses memorables, trouuées en Grece, Asie, Iudée, Egypte, Arabie, et autres pays estranges*, p. 298 (Anvers, 1555). The first edition was published in Paris, 1553. Belon (1518—64) was a prominent traveller and naturalist. "L'amour de la vérité, un désir auide d'acquérir des connaissances, un courage infatigable, l'art d'observer et l'esprit d'analyse, en firent un savant distingué, et on le place au nombre de ceux qui contribuèrent puissamment au progrès des sciences dans le XVI^e siècle. On peut se fier à l'exactitude de ses observations et à la véracité de ses récits" (*Biographie universelle*, Vol. IV, 1811). The author's spelling is retained in the above quotation.

² Explained by E. LITTRE (*Dictionnaire de la langue française*) as "ivoire des morses, de l'hippopotame. HIST. XIV^e siècle. Un coustel à un vieil manche de rohart, DE LABORDE, *Emaux*, p. 486. XV^e siècle. L'ivire et le rochal et les pierres precieuses, DU CANGE, *rohanlum* (où il interprète, probablement à tort, *rochal* par cristal de roche). XVI^e siècle. Par quoy luy en faut adapter d'autres [dents] d'os ou ivoire, ou de dents

est droictement blanche compacte, ressemblant à la Licorne:¹ et est si dure que l'acier à peine y peut mordre, s'il n'est bien trempé. L'autre dent de Rohart est courbée comme celle d'un Sanglier: qu'eussions creu estre dent d'Hippopotame, n'eust esté qu'auõs veu des Hippopotames en vie, qui n'en auoyent pas de telles."² In the Latin translation of Belon's work,³ the name "morse" for the animal has been added: "ut manubrio ex dente beluae marinae *Mors* quibusdam dictae, Gallis *Rohart*, adornent."⁴ Von Herberstein's and Belon's accounts are coeval with the Turkish source indicated by Jacob (p. 317).

An important contribution to the subject is furnished by the Jesuit father AVRIL,⁵ who in the latter part of the seventeenth century gathered the following information from the Russians: "Besides furs of all sorts, which they fetch from all quarters, . . . they have discovered a sort of ivory, which is whiter and smoother than that which comes from the Indies. Not that they have any elephants that furnish them with this commodity (for the northern

de rohart, qui sont excellentes pour cest effet, PARÉ, xvii, 3. *ÉTİM.* Probablement, corruption de *rorqual*" The latter word refers to a species of whale and is explained, after Cuvier, from Swedish *rør* ("tube") and *qual* ("whale"), "baleine à tuyaux, à cause des plis de la peau sous la gorge et la poitrine." In the *Supplément* is added Bugge's etymology from *rohæl*, *rosæl*, Norse *hrosshval*, which is the more probable of the two.

¹ The narwhal.

² The walrus has frequently been confounded with the hippopotamus (compare below the quotation from Avril). The new *Oxford English Dictionary* also states that the term "morse" has been erroneously applied to the hippopotamus. Belon's observation shows conclusively that hippopotamus' teeth are not involved.

³ PETRI BELLONII CENOMANI, *Plurimarum singularium et memorabilium rerum in Græcia, Asia, Aegypto, Iudæa, Arabia, aliisque provinciis ab ipso conspectarum observationes, tribus libris expressæ* C. Clusius Atrebas e Gallicis Latinas faciebat, p. 395 (Antverpiæ, 1589).

⁴ In the same manner the word *morse* (*morsse*) has been interpolated in the early English translations of Ohthere's Anglo-Saxon account, where only the term *hors-hwæl* ("horse-whale" = walrus) occurs.

⁵ *Travels into Divers Parts of Europe and Asia, undertaken by the French King's Order to discover a New Way by Land into China*, done out of French, p. 175 (London, 1693). M. Pelliot has been good enough to call my attention to this source.

countries are too cold for those sort of creatures that naturally love heat), but other amphibious animals, which they call by the name of *Behemot*,¹ which are usually found in the River Lena, or upon the shores of the Tartarian Sea. Several teeth of this monster were shewn us at Moskow, which were ten inches long, and two at the diameter at the root: nor are the elephant's teeth comparable to them, either for beauty or whiteness, besides that they have a peculiar property to staunch blood, being carried about a person subject to bleeding. The Persians and Turks who buy them up put a high value upon them, and prefer a scimiter or a dagger haft of this precious ivory before a handle of massy gold or silver. But certainly nobody better understands the price of this ivory than they who first brought it into request; considering how they venture their lives in attacking the creature that produces it, which is as big and as dangerous as a crocodile." Farther on, AVRIL quotes a

¹ *Behemōth* בְּהֵמוֹת, the Hebrew word used in the Old Testament (Job, xl, 10) for the hippopotamus of the Nile, and presumably derived from Egyptian *p-che-mau* ("water-ox"). In Russian it is бѣремѳтъ. VLADIMIR DAL' (*Complete Dictionary of the Live Great-Russian Language*, in Russian, Vol. I. col. 144) attributes to it only the meaning "hippopotamus," but does not state that it is used with reference to the walrus. It will be seen below (p. 367) that Sir George Watt employs the term "hippopotamus ivory" as synonymous with "sea-horse [narwhal] ivory." See also above, p. 363. On the other hand, *behemōth* was applied in Russia also to the mammoth (Russian *mammont*; C. WITSEN, *Noord en Oost Tatarje*, p. 742), and P. J. VON STRAHLENBERG (*Nord- und Östliche Theil von Europa und Asia*, p. 394, Stockholm, 1720) derived the word *mammōth* from Hebrew *behemōth* through the medium of an Arabic *mechemōth*. H. H. HOWORTH (*The Mammoth and the Flood*, p. 49) therefore thinks that Avril has possibly confounded mammoth ivory with the teeth of walrus or narwhal. In my opinion it is not necessary to assume such a confusion, as Avril plainly describes the hunting of the walrus and nought else; and the term *behemōth* was used rather flexibly, being referred to any large and strange beast, for instance, also to the rhinoceros (*Chinese Clay Figures*, p. 83, note 4). The *Oxford English Dictionary* says that *behemōth* is used in modern English literature as a general expression for one of the largest and strongest animals. Von Strahlenberg's etymology, moreover, is doubtful, and is not accepted by Russian lexicographers. It is more probable that the word *mammōth* is traceable to some language of Siberia, but this is not the occasion for a discussion of this subject.

story told him by the Voyevoda of Smolensk about an island at the mouth of the great River Kawoia, beyond the Obi, that discharges itself into the Frozen Sea. "This island is spacious and very well peopled, and is no less considerable for hunting the *Behemot*, an amphibious animal, whose teeth are in great esteem. The inhabitants go frequently upon the side of the Frozen Sea to hunt this monster; and because it requires great labor and assiduity, they carry their families usually along with them." Avril, accordingly, confirms the fact that the Russians hunted the walrus along the shores of the Arctic Sea, and that the animal's tusks were conveyed to Moscow and traded to the Persians and Turks.

The term "fish-tooth" covers still more ground than Russia, Turkey, and China; it advanced also to Persia and India along with the importation of the article. E. WIEDEMANN¹ has pointed out as a Persian name for "fish-tooth," *dandān māhi* دندان ماهی, occurring in a Turkish work on precious stones by al-Gaffārī, written in 1511—12 and partially translated from the Persian *Tansūq nāmeḥ ilkhāni* ("the Ilkhan Book of Precious Objects"). In this work, the substances occurring in nature are enumerated as fish-tooth from which combs and knife-hilts are turned out, ivory, ebony, *khutū*, etc. But even more than that, the Persians actually possessed fish-teeth² and sent them on to India, as demonstrated by H. BEVERIDGE in a highly interesting article³ suggested by my previous study. In the second volume of his *Memoirs*, Miss BEVERIDGE tells us, the Emperor Jahangir describes how delighted he was when he received from Persia a dagger whose hilt was made of a fish-tooth. He was so much impressed by the

¹ *Zur Mineralogie im Islam*, p. 210.

² Termed also ماهی شیر *šir māhi* "lion-fish," translated "dent de morse" by A. BERGÉ (*Dict. persan-français*, col. 246).

³ *The Emperor Jahangir's Treasures of Walrus and Narwhal Ivory* (*Indian Magazine*, February, 1914, pp. 37—39).

hilt that he despatched skilful men to search for other specimens in Persia and Transoxania. Their instructions were to bring fish-teeth from anywhere, and from any person, and at any cost. A little later a fine specimen was picked up in the bazar of his own capital of Agra, and was brought to him by his son, Shah Jahan. Jahangir had the tooth made into dagger-hilts, and gave one of the craftsmen an elephant as a reward, and bestowed on the other increase of pay and a jewelled bracelet. Miss BEVERIDGE adds further, "The idea that this ivory was an antidote to poison, and also reduced swellings, added greatly to its value. From a statement in the history of Akbar the Great, known as the *Akbar-nāma*, it appears that about 1569 a Rajah in Malabar, who probably was the Rajah of Cochin, sent Akbar a knife which had the property of reducing or removing swellings, and that Akbar told his secretary that it had been successfully applied in more than two hundred cases. Probably this knife was made, wholly or in part, of walrus or morse ivory, which could easily have been brought to Cochin by sea."

The following interesting notes on the subject are contributed by Sir GEORGE WATT:¹

"Ivory is in Indian as in European commerce spoken of as the 'elephant tooth' but a second substance is called the 'fish tooth' (*mahlīka-dant*). This is always of a dirty (oily) yellow color with the texture looking as if crystallized into patches. The significance of being called in every language and dialect of India 'fish tooth' at once suggests a common and, most probably, foreign origin for the material. Upon inquiry it was found that it was more highly valued for sword and dagger hafts and more extensively used for these purposes than is ivory. It is put through an elaborate and protracted process of curing before being worked up. The crude 'fish tooth' is wrapped up in a certain mixture (*masala*) and retained in that condition for various periods, the finer samples for as long as fifty years. The advantages are its greater strength, finer and smoother surface,

¹ *Indian Art at Delhi, 1903, being the official Catalogue of the Delhi Exhibition*, p. 173 (Calcutta, 1903).

and greater resistance (less liability to slip in the hand) than is the case with ivory.

"So far as the writer has been able to discover, the 'fish tooth' of Indian trade is mainly, if not entirely, the so-called fossil ivory of Siberia — the ivory of the mammoth — a substance that has lain for countless ages in the frost-bound drifts of Liakoff and New Siberia. It is also possible that a fair amount of hippopotamus or 'sea-horse ivory' and even of the 'walrus ivory' finds its way to India by passing like the Siberian ivory by land routes to India. And from the antiquity of some of the swords, found in the armories of the princes of India with 'fish tooth' hafts, it would seem possible that there has existed for centuries a traffic in carrying this material to India."

The chain of evidence thus seems to me to be complete: fish-teeth in the sense of walrus ivory were known to the Russians, Bulgar, Turks, Arabs, Persians, Hindu, Mongols, and Chinese; and we may now confidently state that, in whatever European and Asiatic languages and documents the term may still come to the fore, it will invariably refer to walrus ivory.¹

Reference has been made to the Mo-ho as possibly having been acquainted with walrus ivory during the T'ang period (pp. 324, 340). First of all, the passage quoted in the *Man-chou yüan liu k'ao* from the *T'ang hui yao* 唐會要, completed by Wang P'u 王溥 in 961, indeed occurs in this work.² The addition *kio* ("horn") to the term *ku-tu* is rather suggestive, and it now appears certain that this word was known in the age of the T'ang. Further evidence to this effect will be given below. There are now further reasons that strengthen this belief. The Mo-ho were in close proximity

¹ The Russian designation "fish-tooth" seems to have survived to at least the end of the eighteenth century. In S. KRASHENINNIKOV's *Beschreibung des Landes Kamtschatka* (p. 148, Lemgo, 1766), translated from the Russian, we read in the description of the walrus, "Their teeth are what is commonly called fish-bones." The term "horn" is still employed in Russian: VLADIMIR DAL' (*Complete Dictionary of the Live Great-Russian Language*, in Russian, Vol. III, col. 1696) says, "The horn of the narwhal grows out of its jaw-bone, and hence is a tooth."

² Ch. 96, p. 10 b (ed. of *Kiang-su shu kü*, 1896). The text is as follows: 土多貂鼠皮尾骨啣角白兔白鷹等.

and intercourse with the Liu-kuei 流鬼, a people briefly described in the *T'ang shu*.¹ SCHLEGEL² has made a special study of this tribe, and we may agree with him in his main result, — that the geographical position of the country of the Liu-kuei is clearly enough defined to lead us to Kamchatka;³ and that the culture of this people, as characterized by the Chinese, plainly reveals a type that is still found in the North-Pacific area. These cultural traits are, absence of agriculture, economy essentially based on the maintenance of numerous dogs, subterranean habitations, utilization of furs as winter costume, employment of fish-skins as clothing in the summer, and transportation on snowshoes. The Mo-ho entertained a lucrative commerce with the Liu-kuei by way of the sea, the voyage lasting fifteen days; and when the latter in 640 sent a mission to China, it travelled over the Mo-ho country. One of the three interpreters with whom they arrived at the Chinese Court appears to have been a Mo-ho, and the extract in the *Annals* is doubtless derived from a report made by the Mo-ho. The Mo-ho, accordingly, were in intimate touch with a people that had the walrus and its product within easy reach; and from the descriptions of Steller and Krasheniinnikov, on which our knowledge of the ancient Kamchadal or Itelmen now almost extinct is based, we know surely enough that these tribes hunted the walrus and utilized its ivory for industrial work.⁴

¹ Ch. 220, p. 11 b. The text has been published by SCHLEGEL (*Toung Pao*, Vol. IV, p. 336) from the *Pien i tien*; it agrees with *T'ang shu*, except that the latter reads

少海之北 in lieu of 北海.

² *Toung Pao*, Vol. IV, 1898, pp. 335—343.

³ SCHOTT (*Kirgisien*, I. c., p. 448) was the first, though somewhat hesitatingly, to connect the Liu-kuei with Kamchatka.

⁴ G. W. STELLER, *Beschreibung von dem Lande Kamtschatka*, p. 106; S. KRASHENINNIKOV, *Beschreibung des Landes Kamtschatka*, p. 147; V. MARGARITOV, *Kamchatka and Its Inhabitants*, p. 82 (in Russian, Chabarovsk, 1899). According to J. G. GMELIN (*Sibirische Reisen*, Vol. III, p. 164) walrus were numerous in the sea of Kamchatka; and on the shore

Aside from this evidence, actual proof of the occurrence of the word *ku-tu* in the Annals of the T'ang Dynasty may now be offered. In the *T'ang shu* (Ch. 39, p. 9 b) the tribute of Ying chou 營州¹ in Liao-tung is stated to have consisted of ginseng 人蔘, musk,² leopard tails³ and skins 豹尾皮, and *ku-tu* 骨髓. The reading of the latter character is certain, being explained in the *T'ang shu shi yin* (Ch. 4, p. 2 b) as 都骨; that is, *tu*. A definition of the term, unfortunately, is not added; and K'ang-hi's Dictionary, which quotes the same passage under 髓, tells no more. Nevertheless the form in which the term is written is very suggestive: the word *ku* means "bone," and the syllable *tu* is written with a character formed by means of the classifier "bone" (compare p. 319, note);

they found great numbers of discarded teeth that were much larger and heavier than the Greenland teeth, weighing ten, twenty, and thirty pounds each.

¹ It was formerly the district of Liao-si 遼西郡, established under the Ts'in, being 3300 *li* north-east of Lo-yang (*Hou Han shu*, Ch. 33, p. 6 b). It was captured by the Khitan in 696. In 699 it was connected with the administration of Yü yang 漁陽; in 717, with the administration of Liu ch'eng 柳城. In 742 the name was altered into the latter. See chiefly *T'ai ping huan yü ki*, Ch. 71, pp. 4 b *et seq.* This work enumerates as products of Ying chou only leopard tails, musk, pongee 絹, and domestic animals like cattle, horses, sheep, and swine, but does not mention *ku-tu*. Compare also CHAVANNES, *Journal asiatique*, 1898, mai-juin, p. 398.

² Old Pallas had already observed that the musk-deer is distributed over the entire Amur region as far as the shores of the Pacific; and L. v. SCHRENCK (*Reisen und Forschungen im Amur-Lande*, Vol. I, Säugetiere, p. 161) has more accurately defined the localities of its occurrence, inclusive of the island of Saghalin. All the Amur and Saghalin tribes are well acquainted with the animal, and, as has been shown by the writer, it is frequently represented in their decorative art. This point is especially mentioned here, as J. MARQUART (*Osteuropäische und ostasiatische Streifzüge*, p. 82), on the authority of Schlözer (eighteenth century), believes that the musk-deer does not inhabit the northern countries, and doubts the identification of Khitayān ختیاں with Kitai or Khitan, for the reason that excellent musk is mentioned in their country. As far as this point is concerned, the identification is all right. The musk-deer is ubiquitous in Nepal, Tibet, Kukulnor, and the high mountains of Sze-ch'uan, Kan-su, and Shen-si.

³ These were extensively utilized by the Chinese as pendants for their spears and as decorations of chariots.

so that this *ku-tu* apparently refers to a product of osseous nature.¹ It comes from the region of the Khitan, or, in general, from the domiciles of Tungusian tribes,² and this feature brings us in immediate contact with the *ku-tu-si* observed by Hung Hao among the Khitan (p. 318); so that the *ku-tu* of the Tang Annals may be affiliated with the latter, and in all probability refers to walrus ivory.

The word *ku-tu* in the spelling 骨咄, further, appears in the Tang Annals³ as the designation of a wild animal living in the country of the Kirgiz (Kie-kia-se 黠戛斯).⁴ The passage runs thus: "Among the animals of this country, there are wild horses,"⁵

¹ Turkish *kämik* means "bone" and "ivory" (RADLOFF, *Wörterbuch der Türk-Dialecte*, Vol. I, col. 1208).

² According to the *Tai p'ing huan yü ki* (l. c.), the Shi-wei, Mo-ho, and other tribes were settled to the north-east of Liao-ai at a distance varying from two to six thousand li.

³ *Tang shu*, Ch. 217 下, p. 8. Professor Hirth has been kind enough to call my attention to this passage.

⁴ I do not think that this name is to be read Hia-kia-se, as maintained by KLAPROTH (*Mémoires relatifs à l'Asie*, Vol. I, p. 164). Since the name Kyrkyz appears in the Orkhon inscriptions (W. RADLOFF, *Die alttürkischen Inschriften*, p. 425), it seems to me that the Chinese is a regular transcription of this name: 黠 was formerly possessed of initial *k* and final *t* (Japanese *katsun*). Also the writing Kie-ku 結骨 (*ket* or *kyt kut*) is doubtless intended for Kyrkyz. The older name Kien-kun 堅昆 seems to go back to the same original. — [M. Laufer a mille fois raison de considérer Kie-kia-sseu comme la transcription directe du nom des Kirgiz, et non de "Hakas, ancien nom des Kirgiz", comme on le dit généralement. Les prétendus Hakas et les Dulgha, dont M. Pozdnéev maintient la tradition, sont deux *idola libri* dont nous sommes redevables au P. Hyacinthe Bićurin. Le P. Hyacinthe avait en réalité forgé ces noms sur les transcriptions chinoises Kie-kia-sseu et T'ou-kue; mais ces transcriptions représentent simplement Kirgiz et Türk; les Hakas et les Dulgha n'ont jamais existé. Kien-kouen paraît transcrit sur une forme *Qirquu, singulier répondant au pluriel Qiryud qu'on trouve dans les textes mongols; Qirqiz (Kirgiz), qui se trouve déjà dans les inscriptions de l'Orkhon, le *χερχίς* de Méandre, n'est lui-même vraisemblablement qu'une autre forme du même pluriel. — P. PEKTIOT.]

⁵ The numerous references to wild horses, wild asses, and wild camels, in the older Chinese records, are of great scientific significance; but the Chinese terms, unfortunately, are equivocal. The Chinese do not make that fundamental distinction established by our science between wild horses and feral horses; that is, horses descended from domesticated stocks and subsequently reverting to a wild state. This problem of reversion in animals

ku-tu, yellow sheep, *Ovis ammon*,¹ deer, and black-tails resembling the species of deer styled *chang* 麋 but their tails being larger and black."² The Glossary of the *T'ang shu*, unfortunately, gives no

and plants which have run wild was first clearly set forth by DARWIN (*Variation of Animals and Plants under Domestication*, Vol. II, p. 6, Murray's ed. of 1905), and then further developed by Geoffroy Saint-Hilaire and E. HAHN (*Haustiere*, p. 20). It is difficult, if not impossible, to decide in every instance with certainty whether the Chinese, who do not give us descriptions, refer to wild or to feral animals. In a few cases the matter is certain: thus, the "wild" horses of Kan-su are feral horses (HAHN, p. 193). The general rule may be laid down, that, the nearer the locality of the Chinese report to the present habitats of the wild equidae (*Equus hemionus*, *E. A. kiang*, and *E. onager*), the greater the probability that genuine wild horses are to be understood; the farther removed from that centre, the less likely is it to be the case. In a tribe of horsemen like the Kirgiz, whose great wealth of horses is emphasized, it is most unlikely that wild horses still occurred, and the term *ye ma* 野馬 in the above passage would rather seem to mean "feral horses." As to the "wild" horses sent as tribute to the imperial Court (for example, *T'ang shu*, Ch. 37, p. 7 b, where three instances are mentioned), it seems out of the question that wild horses could be meant, nor is there much sense in the assumption that feral horses would be presentable gifts. In this case, another consideration must be made. In the northern steppes of Tibet there are still numerous half-domesticated horses, now called by the Chinese *ts'ao ti ma* 草地馬 "horses of the steppe." These horses are kept and ridden by men, but are not yet accustomed to grain fodder or stall-feeding, and subsist exclusively on grass. While travelling in Tibet, I had several such horses in my caravan; and even when brought to Chinese territory and sheltered in stables, they refused to take any grain. The process of domestication naturally was one of long-continued development, running through many stages; and among the Tibetan nomads we still find horses in the savage or uncivilized state, little cared for by man, and looking for their own means of subsistence. Such-like horses, I venture to presume, were the "wild" tribute horses, and perhaps also other "wild" horses of the Chinese. MARCO POLO (ed. of YULE and CORDIER, Vol. I, p. 260) mentions these horses as peculiar to the Mongols, saying, "Their horses also will subsist entirely on the grass of the plains, so that there is no need to carry store of barley or straw or oats."

¹ 羴 羴 *nguan ti* (see *T'oung Pao*, 1914, p. 71).

² W. SCHOTT (*Über die wälden Kirgisen*, *A. B. A. W.*, 1865, p. 433) omits the *ku-tu* (so does E. H. PARKER, *A Thousand Years of the Tartars*, p. 255) and enumerates as wild animals of the Kirgiz only wild horses, wild goats, and various species of birds-of-prey. KLAPROTH (*Tableaux historiques de l'Asie*, p. 171) has dodged the wild animals entirely; but VISDELOU (in d'Herbelot, *Bibliothèque orientale*, Vol. IV, p. 174) has given the series complete (he transcribes *khou-thou*). For the black tailed deer the *T'ai p'ing huan yü ki* of Yo Shi gives the native word *se-mu* 巴沒, which SCHOTT (p. 471) identifies with *syn* or *sin* ("stag") in the languages of the Koibal and Soyot; this is not very plausible. The Chinese characters point to a word *se-mu*, *se-mur*; and *sämur* is a well-known Turkish

explanation of the word *ku-tu*, the spelling of which coincides with that of the *Cho keng lu* (p. 322) and *Yün yen kuo yen lu* (p. 358). For this reason it may appear as justifiable at first sight to link the *ku-tu* of the Kirgiz with the *ku-tu* of the Khitan region. We remember al-Bērūni's words, that it is asserted in regard to *khutu* (*ohutuwo*) ختو that it is the frontal bone of a bull living in the country of the Kirgiz (p. 316); and when we recall the commercial relations of the Arabs with the Kirgiz,¹ the whole question seems to assume a new turn. It is possible, as stated (p. 354), that al-Bērūni's bull furnishing ivory may be an allusion to the mammoth; or rather it may have grown out of a tradition that the ivory was derived from a "marine bull" (sea-cow, seal). The *ku-tu* of the above Chinese text, however, cannot refer to a mammoth or a walrus, for *ku-tu* is plainly spoken of as a live animal (and the mammoth

word for the sable (RADLOFF, *Wörterbuch der Türk-Dialecte*, Vol. IV, col. 511), used likewise by the Arabs, *semūr* (for instance, in Dimeški's *Cosmography*, also with reference to marten-like and weasel-like animals; see also G. JACOB, *Handelsartikel*, p. 31). — [J'ai vérifié le texte dans le *T'ai p'ing houan yu ki*, ch. 199, fol. 15 v.—16 r.: de l'édition de Nankin, 1882 (sur laquelle cf. *B.E.F.E.-O.*, II, 338—339); il est bien conforme aux indications de Schott. Il est clair que phonétiquement la restitution de M. Laufer serait très satisfaisante, au lieu que celle de Schott est inadmissible. Je me demande seulement si on peut songer à la zibeline quand le texte parle d'un daim. Il ne faut pas oublier qu'un élément d'incertitude provient de la confusion constante dans les textes de 己 *ki*,

已 *yi* et 巳 *ssu*; l'analogie de la transcription *bū-ai*, "premier mois", par 茂師 哀 *mao-che-ngouai* dans le même texte et l'emploi de 沒 pour rendre *bol* (*bolmīd*) sous les T'ang permettent en outre de songer à une forme en *b* au moins autant qu'à une forme en *m*. — P. PELLIOU.] M. Pelliot is right in his contention. In agreement with the indication in the above Chinese text, the Kirgiz employ the term "Black-Tailed" with reference to *Antelope subguturosa*; PALLAS (*Zoographia rosso-asiatica*, p. 252) records this term in the form *kara-keuruk* and translates this "nigri caudata;" POTANIN (*Sketches of North-western Mongolia*, in Russian, Vol. IV, p. 156) writes it *karaguruk* (there are several species of antelopes with black tail). POTANIN (p. 157), further, gives an animal name *bur* as peculiar to the dialect of the Uryaukhayaus ou Lake Terkul and referring to *Cervus alces*. This *bur* may be sought in Chinese 沒, but I do not believe that the animal intended in our text is the elk.

¹ KLAPROTH, *l. c.*, p. 172; SCHOTT, p. 451.

certainly was as extinct in the Tang period as it is now); and, further, Chinese traditions regarding mammoth and *ku-tu* or *ku-tu-si* are not interrelated, but entirely distinct and individual matters (p. 329).

Li Shi-chên, in his discourse on the seal (*iou-nu shou* 脛腓獸), has this interesting passage: "According to a statement in the Tang Annals, the animal *ku-nu* has its habitat in Ying chou in Liao-si and in the country of the Kirgiz" (按唐書云骨狃獸出遼西營州及結骨國). HIRTH¹ has accepted this passage at its face value; but it is evident that in this form it is not contained in the *T'ang shu*, which, as has been shown, with reference to Ying chou as well as to the Kirgiz, speaks of *ku-tu*, not of *ku-nu*; and it is on these two texts that Li Shi-chên's opinion is apparently based. Li Shi-chên, accordingly, makes two points: he combines the *ku-tu* 骨髀 of Ying chou with the *ku-tu* 骨咄 of the Kirgiz, and identifies both with the animal *ku-nu* 骨狃.² This view seems rather sensible, as the first elements of the two forms are identical, and the elements *tu* and *nu* are phonetically interrelated. This matter is not pursued here any further, as it has no relation to the subject under review, but bears on numerous other problems of great complexity. These will be taken up in a special monograph in which the Siberian fauna known to the Chinese will be discussed in detail.³ Suffice it for the present to

¹ HIRTH and ROCKHILL, *Chau Ju-kua*, p. 234, line 21.

² This reading may have existed in some editions of the *T'ang shu*; for K'ang-hi gives it in this manner, quoting it under the word 狃. PALLADIUS (*Dictionary*, Vol. I, p. 436) writes 骨豹, and states, "name of an animal from the dominion of the Kien-kun (Kirgiz)." His entry is probably based on K'ang-hi. Both *ku-tu* and *ku-nu* seem to be correct in this passage, and merely appear as phonetic variants or transcriptions of the same foreign word.

³ In co-operation with M. Pelliot. Our manuscripts were ready in 1914 and would have been published long ago, if the world conflict had not interfered.

remark that the *ku-tu* or *ku-nu* ascribed to the country of the Kirgiz in all probability denotes the beaver.¹

As to the Khitan word *t'u-hu*, M. PÉLLIOT (p. 367) has pointed out a text in the *Liao shi*, and another in the *Kin shi*. The fundamental passage, however, is *Kin shi*, Ch. 43, p. 7 (其束帶曰吐鶻 "the girdles worn by them [that is, the Kin] are styled *t'u-hu*"), where these girdles, with their accessory ornaments, are minutely described. Jade ranked as the supreme material for them; while gold, rhinoceros-horn, ivory, bone, and horn followed suit. The substances employed for *t'u-hu* are noteworthy. If, accordingly, the Emperor T'ien Tsu had a *t'u-hu* made of *ku-tu-si* (p. 359), this was an exceptional case, which simultaneously bears out the fact that *ku-tu-si* cannot have been rhinoceros-horn or elephant-ivory, which were the common materials for *t'u-hu*. There is another piece of evidence to the effect that *ku-tu-si* is neither elephant-ivory nor rhinoceros-horn. M. PÉLLIOT (p. 366) has happily discovered the term *ku-tu* in the Annals of the Kin Dynasty, from which it appears that the Niüchi perpetuated the word inherited by their predecessors, the Khitan. The Niüchi language, however, possessed particular terms for both elephant-ivory and rhinoceros-horn,—*sufa weihe* and *si uihe* respectively;² and these terms, most certainly, are not connected with *ku-tu-si* or *tu-na-si*. The same condition of affairs is reflected in the Annals of the Liao and Kiu Dynasties, where elephant-ivory and rhinoceros-horn are frequently mentioned, and are surely distinct from *ku-tu-si*. The former play a prominent

¹ According to the *T'ang hui yao* (Ch. 93, p. 16 b) the animal *ku-tu* 骨吐, together with panthers and rodents, occurred also in the country of the Yü-che 兪折, while the *T'ang shu* (Ch. 217 下, p. 7 b) locates there only an abundance of sables and rodents. The Yü-che territory was situated fifteen days' journey eastward from the country Kiu 鞠 (identical with the Wu-hunn 烏丸), the latter six days' journey north-east of the Pa-ye-ku 拔野古 (the Bayirku of the Orkhon inscriptions).

² See W. GRUBE, *Sprache und Schrift der Juden*, pp. 31, 93.

part in official and ceremonial costume, and were perfectly known to both Liao and Kiu; while the latter, being a rare article of import, does not.

In regard to the term *pi-si* 碧犀 employed by the *Ko ku yao lun* for the definition of *ku-tu-si* (p. 325), M. PÉLLIOT (p. 365) is quite right in maintaining that it cannot be credited in this passage with the meaning "rhinoceros-horn." The *Pien tse lei pien* (under *pi-si*) cites the text in question as the only instance of the occurrence of the term. T. WADA,¹ the eminent Japanese mineralogist, who is well acquainted with the nomenclature of Chinese mineralogy, observes, "Transparent jewels are much utilized at present in China and more highly esteemed than jade. In distinction from *yü* 玉, the Chinese designate those *pi-si* 璧璽 (that is, precious stone)."

The term *kuo hia ma* 果下馬,² listed as a Khitan word (p. 359), after all, may be purely Chinese. As stated previously, it is not traceable in Korean. Furthermore, it is not applied exclusively to the dwarf ponies of Korea, but also to those of a South-Chinese breed. Fan Ch'eng-ta 范成大, in his work *Kuei hai yü heng chi* 桂海虞衡志, the preface of which is dated 1175, in the chapter dealing with the animals of southern China, makes reference to *kuo hia ma* as being bred in Lung-shui 瀧水 in the prefecture (now *chou*) of Tê-k'ing 德慶 in Kuang-tung Province, where the highest ones are produced; the fine ones, which do not exceed three feet, have two backbones, and are therefore styled also "double-ridge horses" (*shuang chi ma* 雙脊馬), which are robust and fond of walking. In the Ming period these *kuo hia* horses appear among the taxes sent by the prefecture of Chao-k'ing 肇慶, Lung-shui being given as the place of their provenience.³

¹ *Beiträge zur Mineralogie von Japan*, No. 1, p. 19 (Tokyo, 1905).

² First explained by KLAPROTH, *Aperçu général des trois royaumes*, p. 162.

³ *T'u shu tsi ch'eng*, XXVII, 191, *hui k'ao* 9, p. 6.

There is a term of the Chinese language, *k'uei* or *k'ui* 夔,¹ for which the translation "walrus" has been proposed.² Besides this meaning, GILES gives the definition "a one-legged creature," and explains the term *k'uei lung* as "one of the varieties of the dragon." Giles's quotation, "the walrus said to the centipede, 'I hop about on one leg,'" is taken from the philosopher Chuang-tse, and occurs on p. 211 of Giles's translation of this work. At the outset it is difficult to see how Chuang-tse, who lived in the fourth and third centuries B.C., and his contemporaries could have had any knowledge of an arctic animal like the walrus, how the walrus came to be credited with a single leg, and how walrus and centipede could occur in the same geographical area. The rendering "walrus" is conjectural and does not result from the definitions of the word *k'uei* found in early Chinese sources. Thus PALLADIUS³ interprets it in the sense of a "spirit resembling a dragon, with a single foot." COUVEUR states that it is a demon in the shape of a dragon with a single paw, that occurs in the mountains, and cites from the work *Lu yü* that *k'uei* is a strange apparition in the midst of trees or rocks. L. WIEGER⁴ defines *k'uei* as a fabulous animal. The *P'i ya* of the eleventh century says that "*k'uei* is a beast in the eastern sea, having the appearance of an ox, with blue body, without horn, and with a single foot; when entering or leaving the water, there is storm and rain, and its voice is like thunder." An allusion to a marine mammal looms up in this definition, but I hardly believe that it can be referred to the walrus. It is certainly possible that vague descriptions of this creature might have reached the Chinese

¹ Written in various other forms that are recorded in COUVEUR's *Dictionnaire chinois-français*, p. 439.

² GILES, No. 6507.

³ *Chinese-Russian Dictionary*, Vol. I, p. 287.

⁴ *Pères du système taoïste*, p. 343.

through the medium of the Su-shên, Mo-ho, or other northern tribes.¹

The snake-horn of the Kbitan tradition (p. 318)² was revived in a curious manner during the eighteenth century. The *Pên ts'ao kang mu shi i* (Ch. 2, p. 4) contains a lengthy dissertation on a stone called *hi tu shi* 吸毒石 ("poison-attracting stone") not yet mentioned in the *Pên ts'ao kang mu*. From the various quotations given, it becomes clear that this article was introduced into China by the Spaniards 小西洋, and that it is identical with the snake-stone well known in the west, which was believed to originate in the head of a snake, and, when placed on a wound caused by a snake-bite, to draw the poisonous matter out of the body. A certain Mr. Hiao-lan 曉嵐先生, in his work *Luan yang siao hia lu* 灤陽消夏錄,³ tells a very fantastic story anent a huge serpent once seen in Urumtsi with a single horn over a foot in length on its head. A flock of pheasants passed above it, and, attracted by the horn, with fluttering wings fell to the ground like arrows into a jar in the game of pitch-pot (如矢投壺). The horn of this snake is poisonous, and can neutralize poison, and Hiao-lan

¹ In the journal *Kuo sui hio pau* 國粹學報 (Vol. IV, No. 2) there is a series of illustrations of animals after European models, identified with their Chinese names. The animal *k'wei* is here illustrated by the figure of a walrus of European origin. This modern attempt, of course, proves nothing.

² A point which the Arabists did not touch upon in the discussion of *khutū* is that this tradition appears to have spread to Persia; for JOHNSON and RICHARDSON (*Persian-English Dictionary*, ed. STRINGASS, p. 448) assign to ختو *khutū* the significance "the tooth or bones of a viper" (besides, "the horn of a Chinese bovine animal, the horn of a rhinoceros"). I trust that some one will be able to point out the Arabic or Persian source on which this explanation is founded.

³ [Hiao-lan est le *tseu* de 紀昀 Ki Yun, un lettré de la deuxième moitié du XVIII^e siècle, et l'un des principaux rédacteurs des notices critiques du *Catalogue impérial* (cf. Giles, *Biogr. Dict.*, no. 301). Ki Yun avait été exilé à Urumtsi et a même laissé une suite de poésies sur cette ville. Son *Luan yang siao hia lu* est l'une des œuvres qui composent son 閱微草堂筆記 *Yue wei ts'ao t'ang pi ki*. J'ai lu jadis cet ouvrage, dont il y a peu à tirer, tant l'auteur s'y montre accessible aux contes les moins vraisemblables. — P. PELLIER.]

rashly identifies it with the newly introduced poison-attracting stone. The editor of the work, Chao Hio-min, justly opposes this view as incorrect by referring to the article *ku-tu-si* in the *Pên ts'ao*, where the passages quoted agree in stating that the snake-horn cures poison, but, they do not state that it attracts poison.¹

¹ The notion of stones encountered in the heads of serpents and curing snake-bites doubtless originated in India. Three kinds of stones — arising in the heads of man, the serpent, and the frog, respectively — are distinguished in the *Agastimata* (posterior to the sixth century); and according to Varāhamihira (A.D. 505—587), a very brilliant blue-stone is formed in the head of the serpent (L. FINOT, *Lapidares indiens*, p. xx). YULE and BURNELL (*Hobson-Jobson*, pp. 847—849) have devoted an elaborate note to the subject, without pointing out, however, any Indian, Arabic, or Persian references. The earliest testimony mentioned by them is that of the European travellers to India at the end of the seventeenth century. The Arabic views have crystallized in QAZWINI (J. RUSKA, *Steinbuch aus der Kosmographie des al-Kazwini*, p. 15), who describes the snake-stone thus: "This is a stone called in Persian *muhreh-i-mar* ميره مار [VILLERS, *Lexicon persico-latinum* "lapis qui in occipite serpentum reperitur"], being of the size of a small nut, and being found in the heads of many snakes. It has the special effect that, when thrown into curdled milk or hot water in which the bitten organ is placed, it will stick to that spot and suck up the poison." Entirely distinct from the Indian notion is the ophites of PLINY (*Nat. Hist.*, xxxvi, 11, § 56), a kind of marble occurring in two varieties, worn as an amulet, and regarded as a cure for headache and for wounds inflicted by serpents (*dicuntur ambo capitis dolores sedare adalligati et serpentium ictus*). This belief is solely inspired by the name of the stone (from ὄφις, "serpent"), caused by its being marked with streaks resembling serpents in appearance (*serpentium maculis simile, unde et nomen accepit*; compare our term "serpentine"). Pliny's text was adopted by Dioscorides (F. DE MÉLY, *Lapidares grecs*, p. 25) and Ibn al-Baitār (L. LECLERC, *Traité des simples*, Vol. I, p. 412), whose "snake-stone," accordingly, is different from that of Qazwini. The classical and Indian notions are amalgamated in the Armenian *lapidarium* (K. P. PATKANOV, *Precious Stones according to the Notions of the Armenians in the Seventeenth Century*, p. 41, in Russian, St. Petersburg, 1873), which first describes the Plinian "serpentine" and its application to snake-bites, and then joins to it the Indian snake-stone; curiously enough, the latter is characterized as belonging to the species mother-of-pearl, entirely white, round, convex on one side, and smooth on the other, which is bordered by a fine, black edge resembling a coiled snake; the stone is placed on the wound, is rubbed in with honey, and allowed to remain there for eight days. Again, the so-called snake-bezoar is a substance distinct from snake-stone. Bezoar was sometimes designated "snake-stone," and believed to be found in the head of a snake; Pseudo-Aristotle (J. RUSKA, *Steinbuch des Aristoteles*, pp. 147—149, and L. LECLERC, *Traité des simples*, Vol. I, p. 198) gives the best account of it. According to him, bezoar is powdered and administered internally to him who is poisoned; it drives the poison, by means of perspiration, out of the veins of his body. Certainly the theory

Finally I may be allowed to offer some additional comment on

based on this process is different from that upheld in India regarding snake-stone. But Pseudo-Aristotle, in his further discussion of the subject, also reverts to the Indian practice by saying that bezoar, if pulverized and strewn on the sting, attracts the poison and heals the wound; and this is thus far the earliest account traceable as to the conception of bezoar attracting and absorbing poison (吸毒) that agitates a human body (repeated by Qazwini [RUSKA, *Steinbuch aus der Kosmographie*, p. 29] and al-Akfānī [WIEDEMANN, *Zur Mineralogie im Islam*, p. 228]). I am not inclined to believe, however, that this conception arose in the west. There is nothing to this effect in the classical authors, particularly in Theophrastus, Pliny, and Dioscorides. I presume that this notion was developed in India, and has migrated westward. Indian mineralogical ideas occur as early as the Alexandrian epoch in the *Physiologus*, which speaks of "the Indian stone" (F. LAUCHERT, *Geschichte des Physiologus*, p. 37). This stone is described as having the specific quality of sucking up the diseased matter of a dropsical person to whose body it is bound; when the stone is exposed to the sun for three hours, it emits the water and is cleansed. This is exactly the same idea as that expressed by Pseudo-Aristotle in regard to bezoar being an antidote of snake bites. Lauchert emphasizes the fact that exactly corresponding earlier testimony (*scil.* from classical literature) is not known. Since the stone itself is designated "Indian," it is more than probable that also the tradition accompanying it was derived from India. Whether the transfer of the notion concerning the drop-stone to bezoar was effected by Pseudo-Aristotle himself or by an earlier source utilized by him, I do not know. Certain it is that the influence of the *Physiologus*, whether direct or indirect, is apparent in Pseudo-Aristotle. Thus the legend of the parturition-stone (RUSKA, p. 165), localized in India, is found in all versions of the *Physiologus*, and was already booked by HOMMEL (*Aethiopische Übersetzung des Physiologus*, p. xv) as one of the instances of Indian influence on the Greek work. The name *huau*, mentioned for this stone in the Syriac and Arabic translations of the *Physiologus* (E. PETERS, *Der griechische Physiologus*, p. 99), should be traceable, after all, to an Indian language. The snake bezoar is known also in Chinese pharmacology under the name *shé huang* 蛇黃 (a counterpart of *niu huang* 牛黃), "snake yellow." The statement of the *Pén ts'ao* (F. DE MÉLY, *Lapidaires chinois*, p. 133) that it is formed in the belly of snakes, clearly sets it off from the Indian snake-stone which is found in the head of snakes (regarding the various names of bezoar in China, compare the interesting notes of M. PELLIOU, *T'oung Pao*, 1912, pp. 437—438, note). — The word "snake-stone" (*pedra de cobra*) was introduced into Europe by the Portuguese, as we are informed by E. KÄMPFER *Amoenitates exoticae*, p. 395): *ita dictus lapis, vocabulo a Lusitania imposito, adversus viperarum morsus praestat auxilium, externe applicatus*. As the Portuguese imported the article into Europe, it is very likely also that they and the Spaniards brought it to China, as stated in the above Chinese text. A. KIRCHER (*La Chine illustrée*, p. 108) has a lengthy discussion of the snake-stone with an illustration of it and the snake supposed to yield it and called by the Portuguese *cobra de capelos*; he says also that it is partially artificial. All competent informants are agreed that the snake-stone was not a stone, but an artifact, — an opinion shared by Yule, and confirmed by the descriptions of Thevenot, Tavernier,

the Arabic accounts.¹ In his study "Zur Mineralogie im Islam,"² which contains a translation of the mineralogical treatise of Ibn al-Akfānī, E. WIEDEMANN has returned to the question of *khutū* (*chutūw* ختو), and is inclined to regard it as rhinoceros-horn, because al-Akfānī, besides the word *chutūw*, avails himself of the word *chartūt*, and because his informants in Egypt tell him that *chartūt* or *chirtūt* is still the name for the African rhinoceros.³ This may very well be the case, but it cannot be construed to mean that *khutū* as a product is identical with *khartūt*. A critical and historical attitude toward the subject is indispensable. Al-Akfānī is a late author, who died in 1347—48, and who depended entirely, in his statement regarding *khutū*, on his predecessor al-Bērūnī (973—1048). For this reason al-Bērūnī remains the oldest and the

Kaempfer, Tennent, and others. — [C'est le P. Verbiest (1623—1688) qui paraît avoir popularisé en Chine la "pierre qui attire le poison"; il a en effet écrit un 吸毒石原由用法 *Hi ton che yuan yecu yong fa*, "Origine et emploi de la pierre qui attire le poison", dont deux exemplaires se trouvent à la Bibliothèque Nationale (Courant, *Catalogue des livres chinois*, nos. 5321, 5322). Je tiens d'autant plus à attirer l'attention sur ce curieux opuscule qu'il n'en est fait mention ni dans l'*Inprimerie sino-européenne en Chine* de M. Cordier, ni dans les travaux consacrés récemment aux œuvres chinoises de Verbiest, l'un dû au P. Louis Van Hée, *Ferdinand Verbiest, écrivain chinois*, Société d'émulation de Bruges, Mélanges, VII, Bruges, 1913, in-8°, et l'autre au P. H. Bosmans, *Les écrits chinois de Verbiest*, dans la *Revue des questions scientifiques* de juillet 1913. Quant au bezoar, il est absolument certain que c'est là la "pierre *jada*" des Mongols, et il est hors de question de considérer le *jada* comme du jade, ainsi que le fait M. Blochet, dans *J.B.A.S.*, 1914, p. 168. — P. PELLIOI.]

¹ The results of my previous study have meanwhile been acknowledged by G. FERRAND (*Textes relatifs à l'Extrême-Orient*, Vol. II, p. 679), J. RUSKA (*Der Islam*, Vol. V, 1914, p. 239), and Miss A. BEVERIDGE (in the article previously cited). E. WIEDEMANN has been good enough to write me that he sides with my opinion, but that *chutūw* and *charfūt* are also frequently confounded. E. LITTMANN, the well-known Arabist, in a letter kindly addressed to me, says that he has accepted my result, and remarks in regard to the transcription that it is preferable to write simply *chutū* or at best *chutūw*.

² Published in *S.B. P. M. S. Erg.*, Vol. XLIV, 1912, pp. 205—256. The manuscript of my former article on the subject was sent to press in May, 1913; a copy of Wiedemann's work, I received, thanks to the courtesy of the author, on June 26, 1913.

³ It is worthy of note that Wiedemann's inquiries have failed to trace the word *khutū* in modern Arabic. It seems to have shared the fate of Chinese *ku-tu-si*.

pre-eminent Arabic authority on the question. Al-Akfānī simply copies him; and the additions which he makes are merely fanciful, and show that *khutū* as an object of reality was foreign to him. It is necessary to discriminate between actual conditions or realities, and purely literary or bookish reconstructions. Al-Bērūnī does not offer the term *khartūt*, which is plainly an addition peculiar to al-Akfānī, but only the terms *khutū* and "fish-teeth," — the latter, as now conclusively shown, strictly referring to walrus ivory. Nor does he let drop in this connection a word about the rhinoceros or its horn; and this silence is conclusive, as al-Bērūnī, in his account of India, shows himself closely familiar with the rhinoceros of India as well as with that of Africa.¹ Indeed, he is the Mohammedan author who has furnished the best and clearest description of the animal, founded on keen observation. He noticed correctly that it possesses three hoofs on each foot, and that the horn is placed on the top of its nose.² In this description, however, he does not allude to *khutū*, nor in his notice of the latter to rhinoceros.³ It is impossible to assume that a keen observer of his type who correctly described what he saw should have mistaken rhinoceros-horn for any kind of ivory, and it can be stated most positively that such a confusion is out of the question for any one who has ever seen and examined the two.⁴ Only a scribbler or copyist who

¹ E. C. SACHAU, *Alberuni's India*, Vol. I, pp. 203—204.

² See the writer's *Chinese Clay Figures*, p. 95, note 6.

³ Regarding the Arabic names of the rhinoceros, see M. REINAUD (*Relation des voyages faits par les Arabes et les Persans*, Vol. II, p. 66), F. HOMMEL (*Namen der Säugetiere bei den südsemitischen Völkern*, pp. 332, 382, 395), and G. FERRAND (*Textes relatifs à l'Étrême-Orient*, p. 675). No Arabic author has ever used the word *khutū* with reference to the rhinoceros.

⁴ Ivory and rhinoceros-horn are substances of radically distinct biological origin and structure, which do not have a single trait in common. Rhinoceros-horn is an epidermal formation composed of a solid mass of agglutinated hairs or bristles, and has no firm attachment to the bones of the skull, which are merely roughened so as to fit into the concave base of the horn. Ivory is a tooth-substance which in transverse sections displays lines of different colors running in circular arcs.

lacks in critical faculties and is not in touch with life, but with books only, is capable of such confusion; and such a figure is al-Akfānī. This is evidenced by his interpolation that *khutū*, according to some, is derived from the forehead of a large bird which falls on some of these islands (p. 316), — a product naturally different from *khutū* and rhinoceros-horn. It must be conceded that the man who confounds a bird's beak with mammal-tusks is fairly ripe for confusion of the latter with rhinoceros-horn. But such extravagances of an erratic mind cannot really mean that *khutū* designates rhinoceros-horn. The passage of al-Akfānī, in my opinion, is a literary concoction of no value for the whole question.

As regards the horn from the forehead of a large bird, which al-Akfānī has interpolated in the text of al-Bērūnī, Wiedemann has offered no explanation for it; and our Arabists, as far as I know, have not yet discussed this matter, which, however, is well known to students of China. GROENEVELDT¹ appears to have been the first to call attention to it in studying a text of the *Ying yai shêng lan* of 1416 relative to Palembang ou Sumatra, where a bird called "crane-crest" *hao ting* 鶴頂 is described as being larger than a duck, with black feathers and a long neck, the bones of its cranium being over an inch thick, outside red and inside yellow, used by the natives for the handles and scabbards of their swords, and for other different purposes. Groeneveldt, in general, has given a correct

¹ *Notes on the Malay Archipelago*, p. 198 (in *Miscellaneous Papers relating to Indo-China*, Vol. I, London, 1897). Some inadvertencies in his translation have been rectified from the original. — "Crane-crests" are mentioned as tribute from Borneo and Malacca (*Ming shi*, Ch. 325, pp 1, 4 b); also from Bengal (*Si yang ch'ao kung t'ien lu*, Ch. 2, p. 11, ed. of *Pie hia chai ts'ung shu*). The *Tung si yang k'ao* 東西洋考 of 1618 (Ch. 2, p. 19) says after the *Hua i k'ao* 華夷考 that the heads of the birds were sold by the native hunters directly to the Chinese trading-junks for exportation into Fu-kien and Kuang-tung, and that their value equalled that of gold and jade.

identification of the bird by observing that it is not a crane,¹ but the buceros, characterized by a large beak, with an excrescence on the top of it, which is usually hollow, but in some species solid; and that even now it is much used in Canton, where brooches and other ornaments² are cut out of it. The current name of this bird is now *siang* 象鳥. The *Bucerotidæ* form a large family of tropical birds, distributed over India, Ceylon, south-eastern Asia, and the Archipelago, and characterized by the extraordinary development of a horn-like excrescence or protuberance of the upper mandible. The species eagerly sought by the carver is chiefly *Rhinoplax vigil*, the solid-billed or helmeted hornbill, inhabiting the Malay Peninsula, Sumatra, and Borneo, being a shy bird of the highest forest-trees. It has a nearly straight, sharp-pointed bill, the casque being high and in its anterior part a dense and solid mass. The front portions of the bill and the casque are yellow, while the remainder of the latter and the basal portion of the bill are crimson.³ The Chinese

¹ The Chinese Maritime Customs were led into error by distilling from the term *hao ting* "a sort of yellow substance much resembling amber," and believing in its being "the upper part of the beak of a crane" (see the writer's *Jottings on Amber in Asia*, p. 243). No wonder that among the private collectors of America the most fantastic notions are current concerning the character of this product which is usually confounded with amber. In a private collection of Chicago, I once came across a snuff-bottle carved from this material, and labelled by a dealer in China "egret's head" (!). Such errors are interesting to note, because they bring us nearer to the psychology of the Arabs.

² He adds, "for the European market." It may be doubted whether these carvings ever had a large demand in Europe, or were especially made to fill foreign orders. The good specimens, of the K'ien-lung period, are snuff-bottles and girdle-buckles of thoroughly Chinese style, and of such exquisite technical execution that they cannot be suspected of any foreign odor.

³ Compare F. H. KNOWLTON, *Birds of the World*, p. 507 (New York, 1909); *Encyclopædie van Nederlandsch-Indië*, Vol. III, p. 15; and chiefly the fine monograph, illustrated by colored plates, of D. G. ELLIOT (*A Monograph of the Bucerotidæ or Hornbills*, 1882). Collectors of Chinese specimens, suspecting them of being hornbill carvings, may compare the colors of these with the birds on those plates, the colors of which are very exactly reproduced. A section of the bird's cranium is figured in H. O. FORBES (*A Naturalist's Wanderings in the Eastern Archipelago*, p. 155, London, 1885).

carvers display great skill in utilizing to best advantage these two very beautiful colors; in a snuff-bottle, for instance, the yellow portions forming the two large surfaces, and the crimson parts the two narrow sides. The natives of Borneo sometimes carve the hard substance of the beak of the helmeted hornbill into an ear-ornament having the form of the canine tooth of the tiger-cat, a pair of these being worn by elderly men, or men who have captured heads.¹

Following is the information in regard to the bird given in the *T'u shu ts'i ch'eng* (XIX, 42). The earliest text quoted there is the *Nan Yüe chi* 南越志,² where the bird is designated "bird of the King of Yüe" (*Yüe wang niao* 越王鳥).³ "The bird of the King of Yüe is shaped like a kite (*yüan* 鳶), and has on its upper mandible an excrescence (吻末) which has a capacity of over two pints (升). The southerners make wine-vessels out of it,

¹ C. HOSE and W. MCDUGALL, *Pagan Tribes of Borneo*, Vol. II, p. 60.

² A description of southern China by Shên Hwai-yüan 沈懷遠 of the fifth century (BRETSCHNEIDER, *Bot. Sin.*, pt. 1, p. 177).

³ This term is still used in the *Ming shi*, where the bird is listed among the products and taxes of the prefecture of Chao-k'ing 肇慶府 in Kuang-tung Province, and where it is identified with the *mung-tiao* 蒙雕. This indicates that the bird extended (and probably still extends) into southern China. *Yüe niao* 越鳥 "bird of Yüe" is one of the epithets of the peacock (*T'u shu ts'i ch'eng*, XIX, 41, p. 1). According to SCHLEGEL (*Tongy Pao*, Vol. X, 1899, p. 461) "birds of the King of Yüe" are attributed to the country Tan-tan 丹丹 in the *Tung tien* 通典 of Tu Yu 杜佑 (regarding this country compare PALLIOT, *Bull. de l'École française*, Vol. IV, 1904, p. 284). The *Polyglot Dictionary* of K'ien-lung (Ch. 30, p. 36) knows a swallow of Yüe 越燕. The shell of the coconut (*ye-tse* 椰子) is known under the term "head of the King of Yüe" (*Yüe wang t'ou* 越王頭), because the latter, in a feud with the King of Lin-yi 林邑, was assassinated at the instigation of his adversary; and his head, hung from a tree, became metamorphosed into a coconut with two eyes on the shell (*Nan fang ts'ao mu chuang* 南方草木狀, Ch. 2, p. 2, ed. of *Han Wei ts'ung shu*; and BRETSCHNEIDER, *Chinese Recorder*, Vol. III, 1871, p. 244). In a study on *Le coco du roi de Yuch et l'arbre aux enfants* (*Transactions of the Ninth Congress of Orientalists*, London, 1898, Vol. II, pp. 897—906), TERRIEN DE LACOUPELLE has endeavored to correlate the story regarding the head of the King of Yüe with the well-known tale of the tree of the Wāqwāq.

which are highly prized, like conch-shells. The bird does not tread upon the ground, nor drink out of rivers and lakes, nor feed on herbage, nor swallow vermin or fish, but subsists exclusively on the leaves of trees.¹ Its guano resembles the incense *hiün-lu* 薰陸香,² and the southerners get hold of it to prepare incense (or perfume) from it. It is also a curative for various kinds of ulcers."

The *Yu yang tea tsu*³ terms the bird *mung tiao* 蒙鵂,⁴ and states that "its bill is large and the excrescence a foot in length, red and yellow in color, and of a capacity of two pints, and that the southerners make it into wine-cups."

¹ ELLIOT (*l. c.*, p. 3) states, "As a rule the food of *Buceros bicornis* is strictly fruits — certainly so, says Hodgson, at certain seasons, as in the months of January and February, when he found the stomachs contained nothing but the fruit of the Pipal tree. Tickell states that it eats lizards readily, not only from the hand, but will search for them and seize them. With this exception, authors generally agree in regarding fruit as the sole food of this bird." O. BECCARI (*Wanderings in the Great Forests of Borneo*, p. 117) observes that the hornbill subsists mostly on the fruits of various species of *ficus*; these the bird easily plucks with its bill, but it is then obliged to throw each fruit high up in the air, and catch it with open mandibles and a clever jerk. Likewise P. J. VETH (*Java*, Vol. III, p. 282): "Zij leven voornamelijk van vruchten, inzonderheid van die der vijge-boomen." This diet may account for the scent of the bird's dung.

² See the interesting discussion of P. PELLIOT in *T'oung Pao*, 1912, pp. 475—479.

³ Ch. 16, p. 8 (edition of *Pai Has*). According to P. PELLIOT (*T'oung Pao*, 1912, p. 375), this work was written about A.D. 860. It is an excellent source for many questions of Chinese zoölogy and animal-lore.

⁴ Chinese *mung* and *mung-tung* (of the *Kiao chow ki*) are apparently the reproductions of a Malayan name. In the language of the Dayak of Borneo, the bird is called *bungai* and *tingang* (A. HARDELAND, *Dajakisch-deutsches Wörterbuch*, pp. 78, 604). Neither the Malayan word for the hornbill, *enggang* (F. A. SWETTENHAM, *Vocabulary of the English and Malay Languages*, p. 28), nor the Javanese name *rangkok* (VETH, *Javu*, Vol. III, p. 282), furnish the foundations of the Chinese transcription. As the phonetic element 蒙 was anciently **mun* (Japanese *mō*), the word 蒙鵂 may very well have reproduced the syllable *mun* of some Malayan term of the type of Dayak *bungai* (*munai*). There are presumably other Malayan links of the word not known to me. Beaks of the hornbill were sent as tribute from Borneo to China in 1370 (GROENEVELDT, *l. c.*, p. 231; *Ming shi*, Ch. 325, p. 1). — The phrase *mung tiao* would mean "hornbill carvings;" but 雕 is presumably to be corrected to 鵂 "eagle," as shown by K'ang-hi's 象鵂, thus written likewise in the *Yu yang tea tsu*.

Li Shi-chên, in his *Pên ts'ao kang mu*, annotates, "According to the *Kiao chou ki* 交州記, by Liu Hin-k'i 劉欣期,¹ the bird *mung-tung* 蒙鳥 is identical with the bird of the King of Yüe, and is a water-bird. Its habitat is in Kiu-chên 九真 and Kiao-chi 交趾. It is as large as a peacock; its bill is over a foot long and tinged yellow, white, and black, being lustrous like lacquer. The southerners make it into drinking-vessels. According to the *Lo fou shan su* 羅浮山疏,² the bird of the King of Yüe is shaped like a black kite, with long feet, and has on its upper mandible an excrescence like a cap, which may hold over two pints, and which is made into wine-vessels. These are extremely strong and solid. [Then follows the passage on the food and guano of the bird, as in the *Nan Yüe chi*.] Yang Shên 楊慎 (1488—1559), in his *Tan k'ien lu* 丹鉛錄,³ states that the bird *mung-tung* is identical with the one now styled *hao ting* 鶴頂." The *Chêng tse tung* 正字通 does not contain much that is new. It quotes the *T'ung ya* 通雅⁴ to the effect that the bird *hao ting* is the *mung-tung*, but that in fact it is not the crest of a crane; there is also the designation *siang tiao* 象鳥⁵ 雕, referring to the large size of the bird, and this is now the character in vogue for it.⁶

¹ According to BERTSCHNEIDER (*l. c.*, p. 189), "probably fourth or fifth century."

² The second character is omitted in the text; but there is no doubt that the above work is meant, as it is so quoted in the same passage by K'ang-hi (under *mung*), with the addition of the author's name, Chu Chên 竺真 (see BERTSCHNEIDER, *l. c.*, p. 172). The Lo-fou Mountains in Kuang-tung Province, famed for their flora, fauna, and temples, have been described by R. C. HENRY (*Ling-nam*, p. 307, London, 1886) and F. S. A. BOURNE (*The Lo-fou Mountains, an Excursion*, Hongkong, 1895, — a brief but interesting pamphlet of 48 pages).

³ Published in 1554 (WILHE, *Notes*, p. 162). The term *hao ting*, accordingly, is no older than the Ming period.

⁴ A collection of miscellaneous notes by Fang I-chi 方以智 who lived under the last emperor of the Ming dynasty.

⁵ Even without Chinese comment, it may be inferred that this character is a recent, artificial formation, intended to convey the meaning "elephant-bird" (compare our "rhinoceros-bird").

⁶ The *T'u shu tai ch'êng* has added an illustration of the bird which has not the

It is certain that the Chinese accounts unequivocally describe the hornbill which is peculiar to the Indo-Malayan culture-area, and which plays a significant rôle in the religious beliefs of the Malaysans. It is no less certain that al-Akfân's product, derived from the forehead of a large bird, presents an allusion to the same matter. His color descriptions — "changing from yellow into red, and apricot-colored" — are indeed very appropriate. But how is

slightest resemblance to a hornbill. The Peking draughtsman, quite naturally, had never had occasion to see the tropical bird, and pieced his picture together from the scraps which he encountered in the definitions of the text. He consequently sketched a kite on the wing, and added a sort of fantastic wine-vessel above the neck and skull! In a similar manner, the Chinese book-illustrations of the rhinoceros are not based on realities, but on the definitions of the dictionaries. Consequently identifications of such animals cannot be founded on the illustrations, as has been done, but only on the texts. The text is the key to the how and why of the illustration. — It is assumed also that Pliny has made reference to the hornbill. Speaking of the birds called *pegasi* and *grypae*, he states that he looks upon them as fabulous, and proceeds to say that the same is his opinion in regard to the *tragopana*, of which several assert that it is larger than an eagle, has curved horns on the temples, and a plumage of iron color, while only the head is purple (Equidem et tragopana, de qua plures adfirmant, maiorem aquila, cornua in temporibus curvata habentem, ferruginei coloris, tantum capite phoeniceo. — *Nat. hist.*, x, 49, § 70). The identification of the *tragopana* (which literally means the "goat Pan") with the hornbill is still given in the last edition of the *Encyclopædia Britannica*, but this is erroneous. G. CUVIER (*Le règne animal*, Vol. I, p. 479, Paris, 1829) was doubtless correct in terming *tragopana* the napaul or horned pheasant (*faisan cornu*) first described under this name by his great predecessor BUFFON (*Histoire naturelle des oiseaux*, Vol. II, p. 381, Paris, 1773). This bird lives in the Himālayas, chiefly in Nepāl and Sikkim, and is, in the words of Cuvier, "l'un des oiseaux dont la tête est dans le mâle le plus bizarrement ornée; presque nue, elle a derrière chaque œil une petite corne grêle." These lateral fleshy protuberances perfectly answer Pliny's description. The bird is now termed *Cerionis satyra*; and colored illustrations of it may be seen in D. G. ELLIOT (*Monograph of the Phasianidae*, Vol. I, Plate XXII, New York, 1872), or in GOULD (*Birds of Asia*, Vol. VII, Plate XX, 1868). It is apparently this bird which is hinted at in K'ien-lung's *Polyglot Dictionary* (Appendix, Ch. 4, p. 86) by the name *kio ki* 角鷄 "horn pheasant," accompanied by the Tibetan name *bya p'o p'od-dam*; the proper Tibetan designation seems to be *on-log* (SANDBERG, *Handbook of Colloquial Tibetan*, p. 171), which in our dictionaries is rendered "ptarmigan" on the ground of a surmise of I. J. Schmidt. The Lepcha know this species as *ta-ryok-fo* (MAINWARING-GRÜNWEDEL, *Dictionary of the Lepcha Language*, p. 119), and are likewise acquainted with two species of hornbill, — *ka-hlet-fo* and *ka-gron-fo* (*ibid.*, p. 468).

the mystery that al-Akfani places the hornbill on the same level as *khutū*, and possibly rhinoceros-horn, to be explained? This problem is as follows: the Malaysians entertain the belief that hornshavings of the hornbill, placed in a suspected beverage or food, color it blood-red, in case poison has been added.¹ The hornbill substance thus ranked among the poison-detecting remedies, and was easily associated with *khutū* and rhinoceros-horn. This result is instructive, in that my former conclusions as to the development of the beliefs in the virtues of *ku-tu-si* are signally confirmed by it. Nobody could assert that *khutū* originally designated the horn of the buceros bird: this is impossible, for the reason that the Chinese *ku-tu-si* is not linked with this bird, and that the Chinese traditions regarding the latter are a chapter radically distinct and independent of the former. The anti-poisonous property ascribed to hornbill is

¹ H. V. STEVENS, *Materialien zur Kenntnis der wilden Stämme auf der Halbinsel Malaka*, II, p. 134, note 3 (*Ver. Mus. Völk.*, Vol. III, 1894). This explanation of the matter renders intelligible also the following entry under *خنتو khutū* in JOHNSON'S and RICHARDSON'S *Persian-English Dictionary* (p. 448): "A Chinese bird, of whose bones they make handles to knives, which, being dipped into any victuals suspected to be poisoned, are said to have the virtue of immediately discovering it" He who is not satisfied with my explanation of al-Akfani's bird may fall back on another theory. Several Siberian tribes conceive the skulls of the fossil rhinoceros as "birds," and term the horn "bird's claws" (see chiefly H. H. HOWORTH, *The Mammoth and the Flood*, pp. 6 et seq.). This tradition, however, is not known to the Mohammedan writers, whereas fables of the buceros were current among them. The Persian allusion to *khutū* as a "Chinese bird" presents one example. Further we read in Damiri (translation of JAYAKAR, Vol. I, p. 667) about the bird *al-khafaq الخنق* as follows: "Aristotle states that it is a certain large bird found in China, Babylon, and the land of the Turks. Nobody has seen it alive, for nobody is able to catch it in that state. One of its peculiarities is that when it smells a poison, it becomes benumbed or paralyzed, perspires, and loses its senses. Another authority states that on the way to its winter and summer quarters, there are many poisons on the road, and that when it smells one of them, it becomes benumbed and drops dead: its body is then taken, and vessels and knife-handles are made from it. If its bone perceives the smell of a poison, it breaks out into perspiration, by which means poisoned food may be detected. The marrow of the bones of this bird is a poison to all kinds of animals, and the serpent flees away from its bones, so much so that it cannot be overtaken." We apparently meet here an allusion to the buceros based on oral traditions, and it seems preferable to think that it is this bird which al-Akfani had in mind.

a purely Malayan idea, and has apparently been handed on from that quarter to the Arabs during their commercial relations with Malayan tribes. Our Arabists will presumably be able to tell us more about the trade in this article. It is a wholly secondary development that the hornbill was classified in the same category with *khutū*, — a notion absent in al-Bērūnī, who does not know rhinoceros-horn, either, in this connection. The latter is as secondary as the hornbill; and consequently the *khutū* of al-Bērūnī can be neither the one nor the other, but only walrus ivory. His identification of *khutū* with the fish-teeth brought by the Bulgar from the northern sea renders this conclusion quite certain.

Addenda. — P. 349, note 2. The dictionary *Cheng tse t'ung* defines the term *hai ma* as the designation of a fish or seal (*yü*) with teeth as strong and bright as bone and adorned with designs as fine as silk, — workable into implements. Evidently this is the walrus.

P. 375. Regarding the *kuo hia ma* of southern China see also *Ling wai tai ta* (Ch. 2, p. 5; ed. of *Chi pu tsu chai ts'ung shu*).

P. 385. Also the *Ling piao lu i* 嶺表錄異 (Ch. 中, p. 7b; ed. of *Wu ying tien*) has a brief note on the bird of the King of Yüe, and speaks of a yellow cap on its head in the shape of a cup; this cap is so solid that it can be wrought into wine-cups.

NOTES AND QUERIES.

TURQUOIS-MINES IN RUSSIAN TURKISTAN.

In *Notes on Turquoise in the East* (p. 26) reference has been made to turquoise-mines of Ferghana and Samarkand, but the available evidence was of such a nature that I felt obliged to look upon it with some diffidence. I am just in receipt of a 'Catalogue of Useful Minerals of Russian Turkistan' (188 p., with a map) compiled in Russian, in the course of three years, by a mining engineer A. ANDREYEV (Tashkend, 1912, published by the author) where (on p. 108) the first exact indications of turquoise-mines in that region are given and simultaneously show that the previous statements made by other authors were all inexact, and that my attitude of reserve toward them was fully justified. Mr. ANDREYEV points out five sites where turquoise is quarried: 1. in the mountain Altyn-tau in the *volost* Tandyn, district of Amu-Darya, province of Syr-Darya; 2. on the road to Lake Bugadjili near the source of the Ak-sumbe, in the *volost* Karatav, district of Chimkent, province of Syr-Darya; 3. in the locality Taz-kazgoi, in the mountains Ak-tau, in the *volost* Kurgan-t'ubin, district of Djizak, province of Samarkand; 4. in the locality Bir'uza-Sai, 15—16 *verst* in the northwest from the former post-station Murza-Rabat, in the *volost* Ural', district of Khodjend, province of Samarkand; 5. south of the place Shur-ab, 5 *verst* from the ramification of the roads into the valley Shur-ab, almost southward and a bit westward, in the *volost* L'ail'ak, district of Kokand, province of Ferghana.

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NOTES AND QUERIES.

Thus the question of the location of turquoise-mines in Russian Turkistan seems to me to be settled. In the Russian work on 'Precious Stones' by *M. I. Pyl'ayev* (p. 200, St. Petersburg, 1888) the statement is made that turquoise of an inferior quality is found in the mountain Nurata in Bokhāra.

B. LAUFER.

OPTICAL LENSES.

BY

BERTHOLD LAUFER.



I. BURNING-LENSES IN CHINA AND INDIA.

FIRE-PRODUCTION BY MEANS OF OPTICAL LENSES AMONG THE ANCIENTS. — Crystal lenses, wherever employed in ancient times, served for one main purpose exclusively, — the optical method of fire-making. This method is not found among any primitive tribes of the world, but it is restricted to the highly advanced nations settled around the Mediterranean and to the peoples of India and China. W. HOUGH, in his interesting study *The Method of Fire-Making*,¹ has justly observed, "Among the several ways of producing 'pure' fire the mirror and lens presented a worthy method to those ancient cultured nations possessing instruments for focussing light. It can scarcely be said that this was a wide-spread and popular plan for producing fire, but probably was a thing known to priests and scientific men of the day, and viewed as a mystery or curiosity."

The centre of gravity of the following inquiry lies in a new research of this interesting subject, as far as China and India are concerned.² China and India, however, were not isolated in the age

¹ *Report of National Museum*, Washington, 1890, p. 408.

² This study owes its origin to a suggestion received from Dr. Frank Brawley and Dr. Emory Hill, two prominent oculists of Chicago, who are about to issue a comprehensive cyclopædia of ophthalmology, and desire to obtain reliable information on the history of optical lenses in Asia. The second part of this essay will deal with the history of spectacles.

when the utilization of lenses loomed up on their horizons, but partook of the blessings of that great world civilization inspired and diffused by Hellenism. This subject therefore, like all other culture-historical problems, must be visualized within the frame of universal history; and it will hence not be amiss first to pass in review what we know of burning-lenses among the ancients in the western part of the world.

The peoples of classical antiquity were acquainted with two optical instruments for the production of fire, — concave burning-mirrors and convex burning-lenses focussing the sunlight. The question as to whether these are to be attributed to the inventive genius of the Greeks, or were modelled by them on the basis of previous achievements of Mesopotamian civilization, cannot be decided in our present state of knowledge. H. LAYARD¹ (1845) discovered in the palace of the Assyrian King Ashur-našir-pal (885 — 860 B.C.) at Nineveh a rock-crystal lens of plano-convexity, $1\frac{1}{2}$ inches in diameter, with a focus of $4\frac{1}{2}$ inches, cut much like our own burning-glasses, though somewhat crude in its workmanship. It may well have performed the function of a burning-lens, as admitted by modern technologists;² but we should await more evidence before crediting the first invention of burning-lenses to the nations of the Euphrates Valley.

The earliest well-authenticated literary testimony for the use of burning-lenses remains the famous scene in Aristophanes' (c. 450 — c. 385 B.C.) comedy *The Clouds* (Νεφέλαι), written in 423 B.C., where the following dialogue ensues between Strepsiades and Socrates (I quote from T. Mitchell's rendering).³

¹ *Discoveries among the Ruins of Nineveh and Babylon*, p. 197.

² NIEMANN and DU BOIS (in KRÄMER, *Der Mensch und die Erde*, Vol. VII, p. 162); and FELDHAUS, *Technik der Vorzeit*, col. 667.

³ The situation is this: Strepsiades, who has run up a debt of five talents, wants to dodge his obligation by destroying the bill of complaint recorded in wax by operating on it a burning-lens.

- STREPSIADES. I've hit the nail
That does the deed, and so you will confess
- SOCRATES. Out with it!
- STREPSIADES. Good chance but you have noted
A pretty toy, a triquet in the shops,
Which being rightly held produceth fire
From things combustible —
- SOCRATES. A burning-glass,
Vulgarly call'd —
- STREPSIADES. You are right; 'tis so.
- SOCRATES. Proceed!
- STREPSIADES. Put the case now your bailiff comes,
Shows me his writ — I, standing thus, d'ye mark me,
In the sun's stream, measuring my distance, guide
My focus to a point upon his writ,
And off it goes in fumo!
- SOCRATES. By the Graces!
'Tis wittingly devis'd.

This translation is somewhat free, and does not bring out the technical points which are of importance for a consideration of the burning-lens. Strepsiades describes it as a beautiful and diaphanous stone (*λίθος διαφανής ἀφ' ἧς τὸ πῦρ ἄπτουσι*); and what Socrates in the above translation calls a burning-glass is in the Greek *hyalos* (*ὑαλος*). It is presumed that this word here appears for the first time in Greek literature in the sense of "glass,"¹ and accordingly that Aristophanes speaks of burning-lenses made from glass.² The reasons given in support of this opinion, however, are by no means convincing. The first Greek author with a distinct mention of glass is Herodotus (II, 69), who terms it "molten stone" (*λίθος χυτή*) with reference to the ear-rings placed by the Egyptians in the ears of their tame crocodiles. Herodotus (III, 24) likewise is the first to use the word *ὑαλος* in the description of the coffins of the Ethiopians, where it most evidently has the significance of "rock-crystal" or some other

¹ BLÜMNER, *Technologie*, Vol. IV, p. 384.

² M. H. MORGAN, *De ignis eliciendi modis apud antiquos* (*Harvard Studies in Classical Philology*, Vol. I, 1890, p. 46). This is the most complete study of Greek and Roman methods of fire-making, inclusive of burning-lenses and burning-mirrors.

transparent stone;¹ for "they put the prepared body in a crystal pillar hollowed out for this purpose, crystal being dug up in great abundance in their country."² If ὕαλος has in Herodotus, as shown by the inward evidence of the passage, the meaning of "rock-crystal," I see no reason why the same meaning should not be attributed to it in Aristophanes. Besides the passage cited, there is but one other in which the great writer of comedy makes use of the word: in *The Acharnians* the Greek ambassadors, returning from a mission to the King of Persia, report,

"At our reception we were forced to drink
Strong luscious wine in cups of gold and crystal,"³

as J. H. Frere translates with perfect correctness; where Blümner, Morgan, and others, however, see the first mention of glass vessels in Greek records.⁴ It seems to me more probable that gold and crystal vessels are here spoken of. In order to succeed in making the burning-lenses mentioned in *The Clouds* of glass, Morgan is obliged to have recourse to two theories which are unsupported by evidence. We see plainly from the words of Aristophanes, he observes, that glass was very rare in his time (while two pages ahead glass utensils were then at Athens), since he calls it a precious stone (*gemma*); and, as it is said that this stone is for sale in the shops of the pharmacists (*pharmacopola*), it is proved by this very fact that the matter was regarded as a miracle. This "miracle" will fade away, if we adopt the reasonable and natural interpretation of taking ὕαλος in this passage as "rock-crystal" with the specific sense of "burning-

¹ Some authors take it for Oriental alabaster or arragonite, which is transparent when cut thin.

² Thus also Achilles Tatius calls rock-crystal ὕαλος ὀρωρυγμένη.

³ Ἐξ ὑαλίνων ἐκπωμάτων.

⁴ MORGAN (*l. c.*, p. 44) says with regard to this passage that glass utensils were at Athens as early as in Aristophanes' times; the passage, in my opinion, would allow only of the inference that they were at the Court of Persia, and dimly known to Aristophanes.

lens of crystal;"¹ and we are thus released from the necessity of making Aristophanes speak of glass as a precious stone. Strepsiades' description fits "crystal" very well indeed. There are other, historical reasons which warrant the belief that the first burning-lenses were cut from crystal, not from glass, as will be shown by a study of this subject from Chinese and Sanskrit sources.

M. H. MORGAN,² it is true, makes the point that rock-crystal became known only at a late period in classical antiquity, shortly before Augustus; and he reveals the Roman poet Helvius Cinna, and Strabo, who mentions the occurrence of crystals in India, as the earliest authorities. This opinion, however, is not correct. Rock-crystal (ἡ κρύσταλλος) is distinctly alluded to by Theophrastus (372—287 B.C.)³ as a translucent stone together with anthrax, omphax, and amethyst, all of which can be turned into signet-rings.

More important than the material of which the burning-lenses of the Greeks were made is the question as to their purpose and mode of use. The scene in Aristophanes' comedy enlightens us in this respect on two points. The effect of a burning-lens was perfectly known. The legal document of which Strepsiades speaks was certainly draughted on a tablet of wax, and related to a debt which he contracted; he intends to foil his creditors by melting the wax by

¹ This interpretation is adopted by LIDDELL and SCOTT in their *Greek-English Lexicon*.

² *Harvard Studies in Classical Philology*, Vol. I, pp. 44, 48—49.

³ *De lapidibus*, V, 80 (opera ed. WIMMÈU, p. 345, Paris, 1866). This fact is indicated also by KRAUSE (*Pyrgoteles*, p. 16) and SCHRADER (*Reallexikon*, p. 152). Theophrastus is the first Greek author to speak of rock-crystal. As is well known, the word κρύσταλλος occurs in Homer, but has the significance "ice" (derived from κρύος, "chill, frost"); an analogous example is presented by Hebrew *gerah* meaning "ice" and "rock-crystal." The actual utilization of the mineral is certainly much older than the allusions to it in literature. It occurs among the material listed for cylinder-seals in Mesopotamia (HANDCOCK, *Mesopotamian Archaeology*, p. 287) and among the intaglios of the Minoan, Mycenaean, and archaic Greek periods (D. OSBORNE, *Engraved Gems*, pp. 25, 283). On rock-crystal among the ancients, in general compare L. DE LAUNAY, *Minéralogie des anciens*, Vol. I, pp. 22—28; and C. W. KING, *Antique Gems*, pp. 90—97.

means of a burning-lens, and thus to escape judicial proceedings. Such action was not the order of the day, but the specific witty thought sprung by Strepsiades, at which Socrates laughs. The destruction of writs, therefore, was not the real object of burning-lenses; what they really were intended for we may infer from the allusion that they were kept in the shops of the pharmacists. At this point Morgan went somewhat astray by neglecting the statement of Pliny, quoted below, who assures us that crystal lenses were employed in medical practice for cauterizing the skin; and if the Chinese adopted this very same process, the chances are that also the druggists of Athens in the fifth century B.C. kept burning-lenses in stock, not for any fanciful, miraculous purpose, but with a somewhat realistic end in view, — to sell them as instruments useful in certain surgical operations. Cauterization was practised to a large extent in ancient times; and many forms of the cautery were devised, numerous specimens of which have survived.¹

THEOPHRASTUS, in his treatise on fire, mentions crystal, bronze, and silver, when wrought in a certain manner, as means of igniting fire.²

PLINY (23—79), in his *Natural History*, makes two references to burning-lenses, both of crystal and glass. In his chapter on crystal he says, "I find it stated in medical authors that crystal balls placed opposite to solar rays are the most useful contrivance for cauterizing the human body."³ It will be noticed that the Chinese physicians

¹ J. S. MILNE, *Surgical Instruments in Greek and Roman Times*, pp. 116—120. Milne (p. 5) asserts, "The writings of Pliny contain little information of any kind and are absolutely of no use for our purpose;" but Pliny's references to burning-lenses, quoted above, would have found a suitable place in his chapter on cauterics, and assisted in enlightening the text of Hippocrates on p. 120.

² Ἐξάπτεται δὲ ἀπὸ τε τῆς νέλου καὶ ἀπὸ τοῦ χαλκοῦ καὶ τοῦ ἀργύρου τρόπον τινὰ ἐργασθέντων (*De igne*, 73; opera ed. WIMMER, p. 363). Others cancel the words ἀπὸ τε τῆς νέλου and interpret the instruments as concave mirrors (MORGAN, *l. c.*, p. 52).

³ Invenio apud medicos, quae sint urenda corporum, non aliter utilius uri putari quam crystallina pila adversis opposita solis radiis (LXXVII, 10, § 28).

made use of crystal lenses for exactly the same purpose. In the other passage it is remarked, "If glass balls filled with water are exposed to sunlight, they produce such a vigorous heat that they will ignite clothes."¹

LACTANTIUS, the eminent Christian author of the third and fourth centuries, apparently under Pliny's influence, writes that when a glass globe full of water is held in the sun, fire will spring from the light reflected from the water, even in the severest cold.²

ISIDORUS, the learned Bishop of Sevilla (570—636), observes that crystal opposed to solar rays attracts fire to such a degree that it ignites arid fungi or leaves.³ His knowledge is evidently based on Pliny.

Besides the passages in Pliny we find a clear mention of crystal lenses in the *Orphica*, or *Λιθικά* of Orpheus, — a Greek poem wrongly associated with the name of Orpheus, and describing the magical properties believed to be inherent in stones, and revealed by the seer Theodamas to Orpheus. It is not, as formerly assumed, a work coming down from around 500 B.C.,⁴ but it manifestly bears the ear-marks of the late Alexandrian epoch, and is a production of post-Christian times. Crystal opens the series of stones dealt with in this work (Verses 170—184). The deity cannot resist the prayers of him who, bearing in his hand a refulgent and transparent crystal, betakes himself into a temple: his wish will surely be granted. When crystal

¹ Cum addita aqua vitreae pilae sole adverso in tantum candescant, ut vestes exurant (XXXVI, 67, § 199).

² Orbem vitreum plenum aquae si tenueris in sole, de lumine quod ab aqua refulget ignis accenditur etiam in durissimo frigore (*De ira Dei*, X).

³ Hic (crystallus) oppositus radiis solis adeo rapit flammam ut aridis fungis vel foliis ignem praebet (*Origines*, XVI, 13, 1). Fungi used in cauterization are mentioned by Hippocrates and Paul.

⁴ KRAUSE, *Pyrgoteles*, p. 6. The exact date of this work is not satisfactorily established (compare BERNHARD, *Grundriss d. griech. Lit.*, Vol. II, pt. 1, p. 359; and SUSZMIL, *Gesch. d. griech. Lit. in der Alexandrinerzeit*, Vol. I, p. 866).

is placed on dry wood-shavings, while the sun-rays strike it, smoke will soon arise, then fire, and at last a bright flame, regarded as sacred fire. No sacrifice is more pleasing to the gods than when offered by means of such fire.

The ancients, accordingly, employed optical lenses in medicine for cauterizing the skin, and in the religious cult for securing sacred fire. The opinion has been expressed also that they served the purpose of magnifying objects, with reference to a passage in SENECA, that letters, however minute and indistinct, appear larger and clearer through a glass ball filled with water.¹ LESSING² has ingeniously and conclusively demonstrated that there is a wide step from a magnifying-sphere to a magnifying-lens, and that the causes of the enlargement were sought by the ancients, not in the spherical shape of the glass, but in the water with which it was filled. Moreover, the passage of Seneca proves nothing beyond a personal experience of that author; and there is, in fact, no ancient tradition regarding specular or magnifying lenses. In Pompeii, Nola, and Mainz, lenses have been excavated, of which J. MARQUARDT³ says that they could have been nothing but magnifying-lenses. I am unable to admit the force of this conclusion, and think that these lenses were simply burning-lenses.

BURNING-LENSES IN THE MIDDLE AGES AND AMONG THE ARABS.—
The European middle ages are doubtless indebted to the ancients for whatever knowledge of this subject then existed. The mineralogical knowledge of this period is mainly based on the important work of

¹ Jitterae quamvis minutae et obscurae per vitream pilam aqua plenam maiores clarioresque cernuntur (*Quaestiones naturales*, 1, 6, 5).

² *Briefe, antiquarischen Inhalts*, No. 45.

³ *Privatleben der Römer*, p. 752.

⁴ M. H. MORGAN (*Harvard Studies in Classical Philology*, Vol. I, 1890, p. 46) sides with Marquardt and Sacken against Lessing, but on insufficient grounds, and evidently without taking serious notice of Lessing's forcible arguments.

the French Bishop of Rennes, MARBODUS (1035 – 1123), entitled *De lapidibus pretiosis*, and written in Latin hexameters. This poem, largely founded on Pliny, Solinus, and the Orphica, conveyed the classical traditions regarding stones to mediæval Europe, became the direct source of at least four French *Lapidaires*, and successfully maintained its place as the great pedagogical manual on precious stones and as the classical handbook of the schools of pharmacy down to the end of the sixteenth century.¹ In § 41 of his work, Marbodus makes the following observation on crystal lenses:

“But true it is that held against the rays
Of Phœbus it conceives the sudden blaze,
And kindles tinder, which, from fungus dry
Beneath its beam, your skilful hands apply.”²

As regards the further development of this matter, suffice it for our purpose to quote from KONRAD VON MEGENBERG'S (1309—78) *Book of Nature*, — “If the sun shines on a round crystal, it ignites tinder in like manner as the beryl does; if it is round like an apple, and if it is exposed to the sun while it is moist, it ignites extinguished coal,” — and to refer to the *Opus maius* of ROGER BACON (1240—92),³ who attempted to analyze the operation of a burning-lens. But Bacon's essay is dependent on that of the Arabic physicist Ibn al-Haitam (or Alhazen, 965—1039), who treated the problem much more profoundly and scientifically.⁴

¹ Compare the interesting discussion of L. PANNIER, *Lapidaires français du moyen âge*, pp. 15 et seq. (Paris, 1882).

² Translation of C. W. KING, *Antique Gems*, p. 411. In the earliest French translation (PANNIER, *l. c.*, p. 61) this passage runs thus: “Ceste conceit le fon vermeil, | Ki la tient el raî del soleil, | E de cel fou li tondre esprent | S'il i tuchet alques sovent.”

³ *The “Opus maius” of Roger Bacon*, ed. by J. H. BRIDGES, Vol. I, p. 113 (Oxford, 1897).

⁴ Compare S. VOGL, *Physik Roger Bacon*, p. 80. — In regard to the more recent employment of burning-lenses, it is said that some Old-English tobacco-boxes have a lens in the lid for use on emergency; and naturalists still make occasional use of their pocket-lenses as a substitute for a match (*Horniman Museum and Library, Handbook on Domestic Arts*, I, p. 35).

Arabic knowledge of crystal lenses, again, is founded on that of classical authors, and mainly linked with the name of Dioscorides. In the Arabic version of the *Materia Medica* of this Greek author, compiled by Ibn al-Baitar (1197—1248), we find it stated that rock-crystal struck by hardened iron yields abundant sparks; ¹ that a piece of black linen subjected to the rays emitted by this stone, when it is exposed to solar light, will be ignited and consumed; and that it may be employed in this manner in order to obtain fire. ² The Arabic *lapidarium* of the ninth century, traditionally but wrongly ascribed to Aristotle, mentions the sparks of crystal in the same manner, but omits the reference to lenses, which, however, occurs in the Hebrew and Latin translations of the same work. ³ Qazwini, the Arabic encyclopædist of the thirteenth century (1203—83), observes, "If rock-crystal is placed opposite the sun, and if a black rag or a flake of cotton is brought near it, the latter will catch fire, and objects may be lighted with such fire. There is still another kind of rock-crystal, less pure than the former, but harder; whoever beholds it, takes it for salt. If struck with hardened steel, however, sparks will easily spring from it; hence it serves as strike-a-light for the men of the kings." ⁴

¹ The ancient Laplanders made ample use of rock-crystal in the place of flint, and an eye-witness who tried the experiment assures us that rock-crystal struck by the steel yields more sparks than flint (J. SCHEFFER, *Lapland*, p. 416, Frankfurt, 1675). Also in the prehistoric ages of northern Europe, quartzites served for the production of fire (compare the interesting study of G. F.-L. SARRAUV, *Le feu et son emploi dans le nord de l'Europe aux temps préhistoriques*, in *Annales du XVe Congrès archéol. et hist. de Belgique*, Vol. I, Gand, 1907, pp. 196—226, chiefly, pp. 213 et seq.)

² I. LECLEUC, *Traité des simples*, Vol. III, p. 342

³ RUSKA, *Steinbuch des Aristoteles*, pp. 170, 171. The Latin text runs thus: "Bonitas huius lapidis est quod quando exponitur soli rotundatus ut radii solares penetrent ipsum erit ignis ab eo" (*ibid.*, p. 207). The word *rotundatus* denotes a burning-lens.

⁴ RUSKA, *Steinbuch aus der Kosmographie des al-Qazwini*, p. 9. E. WIEDEMANN (*Sitzungsberichte der phys.-med. Soc. Erlangen*, Vol. 36, 1904, p. 332) remarks that the Arabic author omitted the word "globe" after "rock-crystal;" and he thinks it notable that Qazwini expressly speaks of rock-crystal.

Likewise in their knowledge of burning-mirrors, the Arabs depend upon the science of the Greeks, as shown in their discussions of this subject by references to Anthemius and Diocles.¹

REFUTATION OF THE THEORIES THAT THE ANCIENT CHINESE WERE ACQUAINTED WITH BURNING-LENSES. — In passing on to China, we face a bewildering jungle of speculations and opinions as to our subject; and only after clearing this jungle will it be possible to discuss the real facts in the case. If Dr. E. HILL² recently stated that "it is said that a Chinese emperor used lenses as early as 2283 B.C. to observe the stars," we here find expression of that popular opinion which credits the Chinese with lenses prior to the Greeks, — an invention which, as will be seen, was never made by the Chinese themselves. A lens could not have been manufactured at that time, as the materials required for it, glass or rock-crystal, were then unknown in China. Moreover, the Chinese in this case lay no claim whatever to a lens. The text from which this alleged lens (I do not know by whom) has been distilled is contained in the oldest historical record of the Chinese, the *Shu king* (II, 5), in which the astronomical activity of the Emperor Shun is spoken of: he is said to have availed himself of an instrument of jade, the description of which is not given in the text, but only by the late commentators.³ Whatever this instrument of hard, untransparent stone may have been, it surely has nothing in common with a lens.

Even professional sinologues, like SCHLEGEL,⁴ and quite recently FORKE,⁵ have asserted that burning-lenses were known to the Chinese

¹ WIEDFMANN, *Sitzungsberichte der phys.-med. Soz. Erlangen*, Vol. 37, 1905, p. 402.

² *Ophthalmic Record*, Vol. 23, 1914, p. 504.

³ See LEGGE, *Chinese Classics*, Vol. III, p. 33; COUVREUR, *Chou king*, p. 14; CHAVANNES, *Mémoires historiques de Se-ma Ts'ien*, Vol. I, pp. 58—59; and the writer's *Jade*, pp. 104 *et seq.*

⁴ The views of Schlegel are discussed farther on.

⁵ *Lun-hêng*, pt. 2, pp. 496—498.

in pre-Christian times long before they were known to the Greeks. Their conclusions, however, rest on a fallacy due to misunderstandings of the texts. We shall closely examine these, and see how those scholars were prompted to their opinions. It will be demonstrated at the same time that optical lenses of crystal or glass were absolutely unknown in China prior to our era.

Se-ma Chêng of the eighth century A.D. records, in his *Memoirs of the Three Early Sovereigns* (*San huang ki*), the following legend regarding the mythical being Nü-kua or Nü-wa, conceived as a serpent with a human head: ¹ "He fought with Chu-yung [the regent of fire] and failed in victory. Flying into a rage, he butted with his head against Mount Pu-chou and brought it down. The pillar of heaven was broken, and the corners of earth were bursting. Nü-kua then fused five-colored stones to repair the firmament, and cut off the feet of a marine tortoise to set up firmly the four extremities of earth. He gathered the ashes of burnt reeds to stop the inundation, and thus rescued the land of Ki. Thereupon the earth was calm, the sky made whole, and the old order of things remained unchanged." ² The same tradition is contained in the book going under the name of the alleged philosopher Lie-tse, ³ the present recension of which, in all probability, is not earlier than the Han period; likewise in the book of Huai-nan-tse of the second century B.C., ⁴ and in the *Lun-hêng* of Wang Ch'ung. ⁵ The latter philosopher points it out as a very ancient tradition believed by most people.

¹ Originally a male sovereign, but from the second century A. D. represented on the bas-reliefs of the Han period as a woman.

² Compare CHAVANNE, *Mémoires historiques de Se-ma Ts'ien*, Vol. 1, pp. 11, 12; H. J. ALLEN, *Süma Ch'ien's Historical Records* (*Journ. Roy. As. Soc.*, 1894, p. 274); MAYERS, *Chinese Reader's Manual*, p. 162; HIETH, *Ancient History of China*, p. 11.

³ Ch. 5, *T'ang wên* (compare E. FABER, *Naturalismus bei den alten Chinesen*, p. 104; L. GILES, *Taoist Teachings from the Book of Lieh Tzu*, p. 85; L. WIEGER, *Les pères du système taoïste*, p. 131).

⁴ *P'ei wên yüen fu*, Ch. 21, p. 217.

⁵ A. FORKE, *Lun-hêng*, pt. 1, p. 250; pt. 2, p. 347.

Every unbiased student will recognize in this legend concerning Nü-kua a genuine myth, in which a cosmological catastrophe is hinted at, the havoc wrought to heaven and earth being repaired with realistic expedients contrived by a primitive and naïve imagination. He whose trend of mind is bent on interpretation may fall back on the phenomenon of the rainbow, which may have impressed a primitive mind as consisting of stone-like patches for mending the sky after the destructive force of a rainstorm; and the brilliant colors of a quartz or agate may have intimated an association of ideas between the hues of a stone and those of the iris. The composite coloration of a stone may have suggested the effect of a smelting-process; at all events, the molten stones of a legend cannot be taken literally; the casting of metal is naïvely transferred to stones. Be this as it may, or whatever our interpretation of the myth may drive at, it is obvious to every sober mind that the elements of a fantastic myth, which is not reducible to an analysis of actual reality, cannot be utilized as the foundation of far-reaching conclusions as to industrial achievements of the Chinese. Some of our sinologues, however, were of a different opinion. The melting of the five-colored stones ascribed to that fabulous being was a rather tempting occasion for the exercise of ingenious speculations. MAYERS¹ championed the idea that the stone of five colors is coal, the useful properties of which Nü-kua was the first to discover; and T. DE LACOUPERIE,² in a very interesting article, took great pains to demonstrate that the legend has nothing to do with the introduction of glass and the discovery of mineral coal, though by no means himself arriving at any positive result.

Wang Ch'ung,³ in connection with a fire-making apparatus for

¹ *Notes and Queries on China and Japan*, Vol. II, p. 99.

² *T'oung Pao*, Vol. II, 1891, pp. 234-243.

³ *Lun hêng*, Ch. 16, p. 2 (ed. of *Han Wei ts'ung shu*). FORKE, *Lun-hêng*, pt. 2, p. 361.

drawing fire from the sky, mentions the practice, that "on the day *ping-wu* of the fifth month, at noon, they melt five stones to be cast into an instrument that is capable of obtaining fire." According to FORKE,¹ Wang Ch'ung speaks of burning-glasses as, "The material must have been a sort of glass, for otherwise it could not possess the qualities of a burning-glass."² Flint glass, of which optical instruments are now made, consists of five stony and earthy substances, — silica, lead oxide, potash, lime, and clay. The Taoists, in their alchemical researches, may have discovered such a mixture." By interpreting the terms *yang sui* 陽燧 or *fu sui* 夫遂 as "burning-glass," Forke reads of burning-glasses even in the *Chou li*, and is finally carried to this conclusion: "Burning-reflectors were known to the Greeks. Euclid, about 300 B.C., mentions them in his works; and Archimedes is believed to have burned the Roman fleet at Syracuse in 214 B.C. with these reflectors, — probably a myth. Plutarch, in his life of Numa, relates that the Vestals used to light the sacred fire with a burning-speculum. As the *Chou li* dates from

¹ *Ibid.*, p. 496.

² It will be seen below that this conclusion is a fallacy, and is in fact inadmissible; but, granting for a moment its *raison d'être*, the technical point is not so easily settled, as represented by Forke. Wang Ch'ung does not speak of five different stones, but, as demonstrated farther on, indeed speaks of five-colored stones with a distinct allusion to the Nü-kua legend; his term *wu shi* 五石 in this passage being merely a loose expression or abbreviation for *wu se shi* 五色石. If, then, a multi-colored stone is here in question, and if this stone could be identified with a kind of quartz, Forke's opinion, from a technical point of view, would not be utterly wrong; for it is technically possible to make glass from quartz. This experiment was successfully carried on about a decade ago by C. Heræus in Hanau: the quartz utilized was melted in vessels of pure iridium, which melts at 2000°, while the melting-point of quartz is at 1700°. After exceeding its melting-temperature, the quartz becomes glassy. The process itself is difficult and complex, and it would be unreasonable to suppose that a technical manipulation which has succeeded only in our own time should have been familiar to the ancient Chinese, who derived from the West whatever knowledge of glass they possessed. If, however, the "five-colored stone," as shown below, was a variety of agate or soapstone (and this opinion is highly probable), nothing remains of Forke's theory.

the eleventh century B.C. (?), it is not unlikely that the Chinese invented the burning-reflector independently, and knew it long before the Greeks."

TH. W. KINGSMILL once remarked,¹ "Myths have been not inaptly described by Max Müller as a disease of language; and to this category we may perhaps relegate the group of modern myths which have grown up in and around our descriptions of China and its arts." I apprehend that the assigning to the ancient Chinese of burning-lenses belongs to this category of modern myths based on mis-interpretation of terms. BIOT,² SCHLEGEL,³ HIRTH,⁴ and CHAVANNES⁵ have clearly shown that the fire-apparatus spoken of in the *Chou li* was a metal mirror, and the Chinese commentators claim no more for it; even Forke cites their opinion, yet mechanically clings to his idea of burning-glasses. Unfortunately, he omits to tell us how the Chinese of the Chou period — when even a word for "glass," and certainly the matter itself, were unknown to them — should have obtained glass. And if the molten stones of Wang Ch'ung, in Forke's opinion, are glass, the molten colored stones of Nü-kua would be entitled to the same consideration; and thus the baffling result would be attained that not only burning-glasses, but also glass in general, are truly Chinese inventions, the latter going back to the dim past of prehistoric ages.

An intimation that the five-colored or variegated stone is a reality, is first given by Li Tao-yüan 麗道元, who died in A.D. 527, in his commentary on the *Shui king* 水經注, a book on the rivers of China:⁶ "On the northern side of the Hen Mountains, along the

¹ *Chinese Recorder*, Vol. VII, 1876, p. 43.

² *Le Tcheou-li*, Vol. II, p. 381.

³ *Uranographie chinoise*, p. 612.

⁴ *Boas Anniversary Volume*, pp. 226—227.

⁵ *Le Tai Chan*, pp. 188—189.

⁶ Compare CHAVANNES, *Toung Pao*, 1905, p. 563.

Ki River, the rocky hills border the river so closely that there is no space for flat beaches; in places where the water is shallow there is plenty of five-colored stones." ¹ In another passage he refers to carvings from the stone of the same name, which served for the decoration of a palace of the Emperor Wên of the Wei dynasty in A.D. 220.

The *Yün lin shi p'u* 雲林石譜 by Tu Wan 杜綰 of 1193 ² likewise makes mention of five-colored stones 五色石 in the Ki River 溪水 near Sung-tse 松滋, in the prefecture of King-nan 荆南府 (now King-chou), in the province of Hu-pei. Among these are some almost transparent, intersected by numerous lines that are straight like the fibres of a brush, and not different from the agate of Chên-chou 眞州. ³

Another tradition crops out in the Gazetteer of Lai-chou 萊州志, ⁴ according to which the district of Ye 掖縣, forming the prefectural city of Lai-chou on the northern coast of Shau-tung, would produce five-colored stones made into vessels and dishes, and asserted to be identical with the "strange stones" (*kuai shi* 怪石) mentioned in the Tribute of Yü. ⁵ This stone of Lai-chou is well

俱山北溪水所經皆石山略無土岸。其水淺處多五色石 (*P'ei wên yün fu*, Ch. 100 A, p. 16).

¹ Ch. B, p. 5^b (edition of *Chi pu tsu chai ts'ung shu*).

² The latter is found in the water or sandy soil of the district Liu-ho 六合, in the prefecture of Kiang-ning, province of Kiang-su. According to Tu Wan's description, this agate is either a pure white or five-colored, the latter variety being characterized by the same attributes as the stone of Sung-tse; it is locally used for the carving of Buddhist images.

³ *P'ei wên yün fu*, Ch. 100 A, p. 16.

⁴ LEGGE, *Chinese Classics*, Vol. III, pp. 102, 104; COUVREUR, *Chou king*, p. 67; compare *Ts'ien Han shu*, Ch. 28 A, p. 14. Legge remarks that the "strange stones" are very perplexing to the commentators, and that Ts'ai gets over the difficulty by supposing they were articles indispensable in the making of certain vessels, and not curiosities, merely to be looked at. The above identification seems to me very plausible; on account of its numerous shades and curious designs, in which the imagination of the Chinese sees grotesque scenery, the soapstone of Lai-chou could well have merited the name "strange or supernatural stone."

known to us; it is a variety of agalmatolite or soapstone which is still carved by the Chinese into a hundred odds and ends and worked up into soap, the stone being powdered, and the powder being pressed into forms.¹ Its tinges are manifold and very pleasing, and are therefore capable of artistic effects. The Field Museum owns several albums of the K'ien-lung period, containing pictures (人物) entirely composed of Lai-chou stone of diverse colors, neatly cut out and mounted. The stone being very soft, carving is comparatively easy.²

We accordingly note that in post-Christian times the "five-colored stone" has been identified by the Chinese with a variety of either agate or soapstone. This certainly does not mean at the outset that the stone of the same designation attributed by tradition to times of great antiquity must be identical with one or the other; the ancient name *wu sé shi*, whatever it may have conveyed in its origin, may simply have been transferred to certain kinds of agate and soapstone in comparatively recent periods. This stricture being made, however, there remains a great deal of probability that the five-colored stone of Nü-kua, after all, was nothing else; there is, at least, no valid reason why it should have been something else.³ To this interpretation, Forke might object that in the aforesaid passage of Wang Ch'ung the question is not of the melting of five-colored stones, as in the tradition of Nü-kua, but of the melting of five

¹ F. V. RICHTHOFEN, *Shantung*, pp. 199—200. A. WILLIAMSON, *Notes on the Productions of Shan-tung* (*J. China Branch R. As. Soc.*, Vol. IV, 1868, p. 69); BECHER, *Notes on the Mineral Resources of Eastern Shan-tung* (*ibid.*, Vol. XXII, 1888, p. 37); A. FAUVEL, *The Province of Shantung* (*China Review*, Vol. III, 1875, p. 375).

² It is described in the *Fün lin shi p'u*, Ch. II, p. 1^b.

³ T. DE LACOUPERIE (*T'oung Pao*, Vol. II, p. 242) based his theory of five-colored stones on certain geological conditions of Shan-si Province, where, according to A. Williamson, the strata of some hillsides are clearly marked from base to summit, the many-colored clays presenting all the hues of the rainbow. This would not be so bad if the Chinese accounts really spoke of clay; but they obstinately insist on stones, and stone and clay were strictly differentiated notions also to the ancient Chinese.

single stones, and that consequently the aspect of the problem is thus modified; this objection, however, could not be upheld. The solution of the problem is furnished by Wang Ch'ung himself. In two passages of his work, as already pointed out, he himself narrates the tradition regarding Nü-kua, and his mending of the sky by means of five-colored stones. At the end of the chapter,¹ in which he subjects the story to a lengthy discussion, scorning it with ruthless sarcasm, he suddenly changes his phraseology, and speaks of "the repairing of the sky by means of five kinds of stones, which may have worked like medicinal stones in the healing of disease."² Consequently in the diction of the author the two terms "five-colored stone" (*wu sê shi*) and "five stones" (*wu shi*) are interchangeable variants relating to the same subject-matter. It is therefore evident beyond cavil that the passage concerning the fire-apparatus, where the fusing of five stones is mentioned, likewise implies a literary allusion to the Nü-kua legend, and refers to exactly the same affair. If glass is not involved (nor can it be intended) in the Nü-kua legend, it cannot, accordingly, be sought for either, as alleged by Forke, in this passage of Wang Ch'ung.

The question now remains to be answered, Why does Wang Ch'ung bring stones on the tapis to describe an instrument which, judging from all other Chinese records, was a metal mirror? We know that the ancient Chinese possessed mirrors of stone. HIRTH³ has indicated a jade mirror found in A.D. 485 in an ancient tomb near Siang-yaug in Hu-pei Province, which the polyhistor Kiang Yen (443–504) stated to date from the time of King Süan (827–782 B.C.). The *Yün lin shi p'u*⁴ mentions two localities where stone material fit for mirrors was quarried, — Mount Wu-ki 浯溪山, in the district

¹ FORKE, *Lun-hêng*, pt. 1, p. 252.

² This passage is quoted also in *P'ei yü yüan fu*, Ch. 100 A, p. 16.

³ *Chinese Metallic Mirrors* (Bour Anniversary Volume, p. 216).

⁴ Ch. c, p. 9.

of K'i-yang 祁陽, prefecture of Yung-chou 永州, province of Hu-nan, the stone slabs of which, several feet wide, of deep blue (or green) hue, could reflect objects at a distance of several tens of feet; and the district of Lin-ngan 臨安, in the prefecture of Hang-chou 杭州, province of Chê-kiang. In Su-chou, such stone mirrors, usually carved from Yün-nan marble (*Ta-li shi* 大理石), are still offered for sale. When we now critically analyze the passage of Wang Ch'ung, we recognize in it a fusion of three different notions, — first, the alleged melting of stones borrowed from the Nü-kua legend; secondly, a recollection of stone mirrors looming up in his mind; and, thirdly, a reminiscence of metal mirrors used in the Chou period (and also subsequently) for securing fire. In a word, his description is a downright literary concoction, pieced together from three different sources; and it is therefore impossible to regard it as an authentic and authoritative source from which any conclusions as to realities may be derived. It can prove absolutely nothing for the elucidation of facts, such as glass, burning-glasses, burning-mirrors, or anything else. Forke's thesis of the alleged priority of the Chinese in the matter of burning-glasses is untenable; and the fact remains, much more solidly founded than assumed by Forke, that the ancients were the first to make use of them.¹

Another weapon, seemingly still more formidable, has been introduced into the discussion by Schlegel. Liu Ngan, commonly known under the name Huai-nan-tse, a member of the imperial family, philosopher and alchemist, who died in 122 B.C., is credited by SCHLEGEL² with the statement that "it is not absolutely necessary

¹ Forke has not clearly discriminated between burning-lenses and burning-mirrors. I hope to devote a monograph to the latter subject with particular reference to the relation of the Greek burning-mirrors to the Chinese. So much may be said here that Greek priority seems to me to be established along this line also.

² *Uranographie chinoise*, p. 112; and *Nederlandsch-Chineesch Woordenboek*, Vol. I, p. 674.

to employ a bright metal plaque, but that a large crystal ball likewise, held toward the sun, can produce fire." Consequently burning-lenses should have been known to the Chinese in the second century B.C. This would indeed be very nice, were it not that Huai-nan-tse never made such an assertion, wrongly attributed to him by Schlegel. Of all that Schlegel makes him say, he has in fact said only the very first sentence,—"When the mirror is held toward the sun, it will ignite and produce fire,"—while all the rest of it does not emanate from the philosopher, but from his later commentators. Schlegel, indeed, does not quote Huai-nan-tse's original text, but derives the passage from a recent work, *Liu ts'ing ji cha* 留青日札.¹ We need only refer, however, to Huai-nan-tse's actual text,² to recognize at a glance the real state of affairs. Huai-nan-tse knew only of concave metal mirrors for the production of fire, but nothing whatever about crystal or any other lenses. He repeatedly mentions the former,³ but never the latter, nor does any of his contemporaries, for the reason that lenses did not turn up on the horizon of the Chinese before the beginning of the seventh century A.D.⁴

BURNING-LENSES NOT A CHINESE INVENTION. DEFICIENT KNOWLEDGE OF THE SUBJECT ON THE PART OF THE CHINESE.—China has indeed known lenses, and certain optical properties of them; yet they were not invented by the Chinese, but were received and introduced by them from India. This fact will be established by the investigation to follow. The subject is somewhat complex, and has never been clearly set forth by any author, Chinese or foreign. It is indispensable to penetrate into the primeval sources, and to sift their

¹ A collection of miscellaneous essays by T'ien Yi-hêng, a writer of the Ming period.

² Ch. 3, p. 2 (edition of *Han Wei ts'ung shu*). In the commentary of this edition no reference is made to crystal lenses; their mention is simply an utterance of the author of *Liu ts'ing ji cha*.

³ For instance, Ch. 5, pp. 11, 14; Ch. 6, p. 2^b; Ch. 8, p. 1^b; etc.

⁴ Another argument of Schlegel in favor of early Chinese acquaintance with burning-lenses is discussed below in the paragraph on ice-lenses.

data with critical eyes, as the recent Chinese writers have been unable to cope with the matter properly; at any rate, none of their statements can be accepted without careful examination. Li Shi-chên, the great Chinese authority on physical science in the sixteenth century, who spent a lifetime on the elaboration of his praiseworthy work *Pên ts'ao kang mu*, has summarized his knowledge of optical lenses (*huo chu* 火珠, "fire-pearls") as follows:¹ "The dictionary *Shuo wên* designates them as 'fire-regulating pearls' (*huo-ts'i-chu* 火齊珠).² The Annals of the Han Dynasty style them *mei-hui* 玫瑰, these characters having the sounds *mei hui* 枚回. The Annals of the T'ang Dynasty narrate that 'in the south-eastern ocean there is the Lo-ch'a country 羅刹國 producing fire-regulating pearls, the biggest of these reaching the size of a fowl's egg, and in appearance resembling crystal 水精. They are round and white, and emit light at a distance of several feet. When exposed to the sunlight, and mugwort is placed near, the latter is ignited.' Such lenses are used in the application of moxa, which in this manner is painless.³ At present there are such lenses in Champa (Chan-ch'êng 占城), which are styled 'great fire-pearls of the morning dawn' (*chao hia ta huo chu* 朝霞大火珠). The *Sü Han shu* 續漢書⁴ says that the country of the Ai-lao barbarians⁵ pro-

¹ *Pên ts'ao kang mu*, Ch. 8, p. 18. This notice is an appendix to his account of rock-crystal.

² This translation and its meaning will be explained in the following section. We have no adequate word to cover exactly the meaning of Chinese *chu* 珠, which means not only a "bead" or "pearl," but also a "gem or precious stone," usually of circular shape. Already D'HERBELOT (*Bibliothèque orientale*, Vol. IV, p. 398) has explained correctly these various shades of meaning.

³ This sentence is not contained in the T'ang Annals, but is Li Shi-chên's own statement. For explanation see below.

⁴ A continuation of the official history of the Han dynasty, written by Sie Ch'êng 謝承 of the third century.

⁵ 哀牢夷. These tribes (their Chinese designation is preserved in the name "Lao") formed the Shan kingdom, first appearing in history during the first century of our era, in the present territory of Sze-ch'uan and Yün-nan.

duces stones styled *huo-tsing* 火精 ('fire-essence') and *liu-li* 琉璃. In view of this fact, the term *huo-ts'i* 火齊 is an error for *huo-tsing* 火精; the latter is correct in correspondence with the term *shui-tsing* 水精 ('water-essence,' a name for rock-crystal).¹ It will be seen from the following discussion that this notice is very inexact in detail, and altogether highly uncritical, — a defect for

¹ F. DE MÉLY (*Lapidaires chinois*, p. 60), who has partially translated this text (not from the original, but from a late Japanese cyclopædia), gives wrong characters and transcriptions of the Chinese terms, — *kim koei* instead of *mei hui* (or *mei hwei*, or *mei kwei*; see farther below), and *ho chai* in lieu of *huo ts'i*. Moreover, the rendering of *huo chu* by "lupe" is inadmissible, as neither the Chinese nor the Indians have ever made use of magnifying-lenses, but both peoples were familiar only with lenses for fire-making. — The term *huo-tsing* is not an error for *huo-ts'i*, as assumed by Li Shi-chên, but denotes a red variety of rock-crystal supposed to attract fire, while the white variety of the same stone attracts water and fire at the same time (*Wa li siao shi*, Ch. 7, p. 13^b); *huo-tsing* and *huo-ts'i*, in fact, refer to different minerals. In the same manner as among the ancients, the speculations of the Chinese concerning the nature of rock-crystal were divided between the opinions that, on the one hand, it was the essence of water (owing to the outward resemblance to ice) and, on the other hand, the essence of fire (because when struck with steel, it yields sparks, or when used as a lens, produces fire). HIRTH (*China and the Roman Orient*, p. 233) is quite right in deriving the former theory from classical lore. I hope to come back to this subject in detail in a series of studies dealing with Chinese-Hellenistic relations. In opposition to PLINY (XXXVII, 9, § 23), who takes crystal for a kind of ice due to excessive congelation, found only in regions where the winter snow freezes most intensely (*Contraria huic causa crystallum facit, gelu vehementiore concreto. Non aliubi certe reperitur quam ubi maxime hibernæ nives rigent, glaciemque esse certum est, unde nomen Graeci dedere*), DIOBORUS SICULUS of the first century B. C. expresses the view that crystal originates from purest water hardened into ice, not by cold, however, but through the powerful effect of solar heat (*Crystallum ex aqua purissima in glaciem indurata coalescere aiunt, non quidem a frigore, sed divini ignis potentia*). The celebrated French Bishop MANDOUX (1035—1123) attacked the glacial theory in his poem *De lapidibus pretiosis* (§ 41) as follows: "Crystallus glacies multos durata per annos, | Ut placeat doctis, qui sic scripsere, quibusdam, | Germinis antiqui frigus tenet atque colorem. | Pars negat, et multis perhibent in partibus orbis | Crystallum nasci, quod non vis frigoris ulla, | Nec glacialis hiecus unquam violasse probatur." In China, the same theory was called into doubt by Ts'ao Chao 曹昭 in his *Ko ku yao lun* 格古要論, published in 1387: "Although it is said that many years old ice becomes rock-crystal, this is obviously false in view of the fact that green and red crystals occur in Japan" (多年老冰爲水晶然日本國有青水晶紅水晶則水晶非冰也明矣). — an attempt at scientific thinking.

which Li Shi-chên himself is not solely responsible, but which already adheres to his uncritical predecessors. We note, first of all, that he avails himself indiscriminately of three terms, — *huo chu* ("fire-pearl"), *huo-ts'i-chu* ("fire-regulating pearl"), and *mei-hui*. On a previous occasion I ventured to express doubts of the alleged identity of the former two terms;¹ and it will now be demonstrated that they indeed relate to two different mineral substances associated by the early Chinese accounts with two different traditions. In fact, neither the *Shuo wen* nor the Han Annals speak of burning-lenses; Li Shi-chên, however, is quite correct in tracing them to the Lo-ch'a country, but cites the T'ang Annals wrongly by assigning to them the term *huo ts'i chu* instead of *huo chu*. This text of the T'ang Annals indeed is the first and earliest authentic Chinese account relative to burning-lenses. We note also that Li Shi-chên does not claim any knowledge of them on the part of Wang Ch'ung or Huai-nan-tse; and, as far as I know, there is no Chinese author who would make such a pretension. The various problems raised by the text of the *Pên ts'ao kang nu* will now be discussed in detail.

HUO-TS'I NOT A BURNING-LENS, BUT MICA. — The earliest definition of the "fire-regulating pearl" (*huo ts'i chu* 火齊珠)² that occurs

¹ *Notes on Turquois in the East*, p. 28.

² HIRTH and ROCKHILL (*Chau Ju-kua*, p. 113) express the opinion that *huo ts'i* appears to be a foreign word, without being able, however, to indicate for which foreign word it might be intended. This supposition is hardly probable, as the phrase *huo ts'i* is good old Chinese, and yields a reasonable sense. It occurs in the ancient Book of Rites (*Li ki*, chap. *Yüe-ling*, ed. COUVREUR, Vol. I, p. 401; LEGGE's translation, Vol. I, p. 303): "In the second month of winter, orders were given to the grand superintendent of the preparation of liquors to see that the rice and other glutinous grains be all complete, etc., that the water be fragrant, that the vessels of pottery be good, and that the regulation of the fire (*huo ts'i* 火齊) be right." The term *huo ts'i chu*, accordingly, is very well fitted to signify "a pearl (or gem) used in regulating fire." Indeed, the term *huo-ts'i*, as shown farther on, has been employed for a mineral indigenous in China, and belonging to the mica group, prior to her contact with India; we hear, for instance, of screens (*Shi ki*, Ch. 5, p. 6; ed. of *Han Wei ts'ung shu*), couches, and finger-rings of *huo-ts'i*, of native manufacture (*ibid.*, Ch. 8, p. 3). This subject is not pursued here any further, as it will be treated by the writer in a special monograph on mica.

in the Annals of China is embodied in the History of the Liang Dynasty,¹ which enumerates it among the products of Central India, and describes it as follows: "Huo-ts'i, in its appearance, is like the mica of China,² with a tinge like that of purple gold, and of intense brilliancy. Pieces split off from it are as thin as the cicada's wings; when joined together again, they are like doubled silk gauze."³ This text, however, is not peculiar to the two Annals, but is

¹ *Liang shu*, Ch. 54, p. 7^b. The Liang dynasty covers the period from 502 to 556. Its history was compiled by Yao Se-lien in the first half of the seventh century. The same text is found also in *Nan shi* (Ch. 79, p. 7). The latter work, comprising the history of China from 420 to 589, was elaborated by Li Yen-shou in the seventh century.

² In Chinese *yün-mu* 雲母 (literally, "cloud-mother"). On the basis of a specimen obtained from China, *yün-mu* was identified with mica by E. BIOT (in PAUTHIER-BAZIN, *Chine moderne*, Vol. II, p. 558), who also rejected Rémusat's interpretation of this term as "mother-o'-pearl" (this meaning is erroneously given by PALLADIUS, *Chinese-Russian Dictionary*, Vol. II, p. 543). He pointed out seven varieties bearing different names. Under the same name, *yün-mu*, the different varieties of mica have well been described by GEERTS (*Produits de la nature japonaise et chinoise*, Vol. II, pp. 426-433); while F. PORTER SMITH (*Contributions toward the Materia Medica of China*, p. 210) mistook *yün-mu* for talc, though describing mica under that title. G. SCHLEGEL (*T'oung Pao*, Vol. VI, 1895, p. 49) has contributed to the subject a few notes which are rather inexact; only his erroneous view that *yün-mu* is a modern term, may here be pointed out. As in many studies of orientalists we meet the phraseology "mica or talc," it cannot be strongly enough emphasized that mica and talc are fundamentally different minerals; and it is even difficult to see how they could ever be confounded. The word *yün-mu* has been adopted for the designation of mica in the modern scientific mineralogy of China and Japan (see, for instance, *Journ. Geol. Soc. of Tōkyō*, Vol. XIX, 1912, p. 413), while talc is *hua shi* 滑石 or *fei-tsau shi* 肥皂石; the identification of *yün-mu*, therefore, is absolutely certain. The Chinese name arose in consequence of the belief that this mineral forms the basis in the origin of the clouds; that is, strictly speaking, the clouded appearance of the mineral was instrumental in inspiring this popular belief. The Sanskrit designation for mica is *abhra*, a word appearing as early as the fifth century in the Bower Manuscript (A. F. R. HOERNLE, *The Bower Manuscript*, pp. 11, 117). This word means literally "cloud, atmosphere," and thus presents a curious counterpart of the Chinese designation for the same mineral, *yün-mu* ("cloud-mother"). The Chinese alchemists took powdered mica internally in order to insure long life; and when placed in the grave, it was believed to have the effect of preserving the body from decay.

火齊狀如雲母。色如紫金。有光耀。別之則薄如蟬翼。積之則如紗縠之重沓也。

encountered as early as the third century in the *Nan chou i wu chi* 南州異物志 ("Account of Remarkable Objects in the Southern Provinces"), by Wan Chên 萬震,¹ where it is prefaced by the statement that *huo-ts'i* comes from, or is produced in, the country of India;² and it is this work which has doubtless served as a source to the annalist. The brief description of the mineral is perspicuous enough to enable one to recognize in it mica, — a group of minerals that crystallize in the monoclinic system, and consist essentially of aluminum silicate. The striking characteristic of all species is a highly perfect basal cleavage, by which the crystals may be split into the thinnest films (that is, the cicada wings of the Chinese). It is to this property, and to the highly elastic nature of the lamellæ (by which mica is distinguished from the flexible, foliated, but inelastic mineral, talc), as well as to the fact that it is able to withstand high temperatures and is a bad conductor of electricity, that mica owes its commercial value.³

It was not in India, however, that the Chinese acquainted themselves with mica for the first time. Mica is indigeuous in many places of China; and a contemporary of Wan Chên, Chang Pu 張勃, the author of a geographical description of the kingdom of Wu,⁴ mentions the mineral "*huo-ts'i*, which is like *yün-mu*, as occurring

¹ According to *Sui shu* (Ch. 33, p. 10), Wan Chên lived in the time of the Wu dynasty (third century).

² 火齊出天竺國 (*T'ai ping yü lan*, Ch. 809, p. 2). The only variant encountered in this text is in the fourth sentence: 節如蟬翼 instead of 別之 etc., as above. The *Pén ts'ao kang mu* (Ch. 8, p. 18), in the notice of *lin-ü*, quotes the same text from the work *I wu chi*, which says that the stone is a product of all countries of southern India.

³ Compare the excellent article "Mica" in G. WATT's *Dictionary of Economic Products of India*, Vol. v, pp. 509–513 (also as separate reprint), where its uses, geological and geographical distribution, as well as mining and trade in India, are fully discussed.

⁴ *Wu lu ti li chi* 吳錄地理志 (see BRETSCHNEIDER, *Bol. Sin.*, pt. 1, No. 1043).

in the district Si-küan.¹ It is composed of many layers, and can accordingly be split. It is of yellow color, resembling gold."² This, again, is an unmistakable characterization of mica, and of that variety known to us as golden mica (*or de chat*).³ We note that a kind of mica was known in China under the name *huo-ts'i*, and that the Chinese merely rediscovered this particular species in India; the term *huo-ts'i*, therefore, cannot be the rendering of a Sanskrit word, and such a Sanskrit name as might come into question, indeed, does not exist.

Huo-ts'i are referred by the Chinese also to some countries located in south-eastern Asia. In the year 519, Jayavarman, King of Fu-nan (Cambodja), sent an embassy to China, and offered pearls of that description, saffron (*yü-kin*), storax, and other aromatics.⁴ In 528 and 535 two embassies arrived in China from a country called Tau-tau 丹丹, and *huo-ts'i* pearls or beads were included among the tribute-gifts of the latter mission.⁵ Very little is known about this country, and its identification is not ascertained. At the time of the T'ang dynasty (618—906) it is mentioned again as being situated south-east of the island of Hai-nan, and west of the

¹ As the kingdom of Wu comprised the present territory of Kiang-su, Chê-kiang, and parts of An-hui, this locality must have been within the boundaries of these provinces.

² 西徠縣有火齊如雲母。重沓可開。黃似金
(*T'ai p'ing yü lan*, Ch. 809, p. 2). The coincidence of the terms used in this text and the *Nan chou i wu chi* is notable.

³ Now termed in Chinese *kin sing shi* 金星石 ("gold star stone") or *kin tsing shi* 金精石. See GEERTS, *Produits de la nature japonaise et chinoise*, Vol. II, p. 430; D. HANBURY, *Science Papers*, p. 219; and F. PORTER SMITH, *Contributions toward the Materia Medica of China*, p. 148, who mentions Kiang-nan as a locality where it occurs; this is probably identical with that mentioned in the above Chinese work. The Imperial Geography (*Ta Ts'ing i t'ung chi*, Ch. 244, p. 11) mentions the district of Tê-hua (forming the prefectural city of Kiu-kiang, province of Kiang-si) as producing mica (*yün mu*).

⁴ *Liang shu*, Ch. 54, p. 5^b; or *Nan shi*, Ch. 78, p. 4 (compare PELLIOU, *Bull. de l'École française*, Vol. III, p. 270).

⁵ *Liang shu*, *ibid.*

country To-lo-mo 多羅磨, which is otherwise unknown to us.¹ G. SCHLEGEL,² in a discussion of this passage of the Liaug history, without adducing any evidence, rendered the term *huo-ts'i* by "Labrador feldspat," which is an arbitrary and unwarranted opinion.³ Both Fu-nan and Tau-tan, this much is certain, were countries in the sphere of influence of Indian civilization; and in the same manner as Fu-nan received diamonds in consequence of its lively intercourse with India,⁴ so also its *huo-ts'i* gems were undoubtedly derived from the same source.

Aside from India, Fu-nan, and Tan-tan, *huo-ts'i* are listed in the Chinese Annals also among the products of Persia; that is, Persia in the epoch of the Sassanian dynasty.⁵ Since Persia was then in close relations with India, it is highly probable that the *huo-ts'i* of Persia, like many other products attributed to the country by the Chinese,⁶ also hailed from India. We shall revert once again to Persia when discussing the term *mei-hui*.

There is not a single ancient Chinese account that speaks of the use of burning-lenses in regard to *huo-ts'i*.⁷ The only purpose to

¹ *T'ang shu*, Ch. 222 B, p. 4 (compare PELLLOT, *Bull. de l'École française*, Vol. IV, p. 284).

² *T'oung Pao*, Vol. X, 1899, p. 460.

³ Schlegel's view that the country Tau-tan should be sought for on the Malay Peninsula, and be identified with the mysterious Dondin, placed by Odoric of Pordenone of the fourteenth century between Ceylon and China, has been refuted by PELLLOT (*l. c.*).

⁴ India traded diamonds with Ta Ts'in, Fu-nan, and Kiao-chi (*T'ang shu*, Ch. 221 A, p. 10^b).

⁵ *Pei shi*, Ch. 97, p. 7^b; *Wei shu*, Ch. 102, p. 5^b; *Sui shu*, Ch. 83, p. 7^b.

⁶ HIRTH and ROCKHILL, *Chau Ju-kua*, p. 16.

⁷ The conclusion of some Chinese authors that *huo-ts'i* are burning-lenses may have been prompted partially by the report of a mica mirror (*huo ts'i king*) contained in the *Shi i ki* (Ch. 3, p. 6^b; ed. of *Han Wei ts'ung shu*). This mirror, three feet in width, is alleged to have been sent as a gift by a country styled K'ü-sü 渠胥, at the time of the Emperor Ling of the Chou dynasty (571—545 B.C.). In a dark room, objects were visible in it as in the daytime; and when words were spoken in the direction of the mirror, an echo sounded from it as answer. HIRTH (*Boas Anniversary Volume*, p. 228) sees in this mirror a practical demonstration of the theory of sound-reflection, coupled

which the latter was turned was for making lanterns transparent and durable. This confirms the fact that *huo-ts'i* is mica, for the earliest application of it in India and China was in windows and lanterns.¹ Muscovite, a variety of mica, is still employed for lamp-chimneys, as fire-screens in the peep-holes of furnaces, and as screens in the laboratory, for observing the processes in a highly heated furnace without suffering from the intense heat. It is thus clear why the Chinese called this mineral *huo-ts'i* "fire-regulating;" and it is also clear that, since mica cannot by any means be made into a burning-lens, the alleged identity of *huo-ts'i* with the burning-lens styled *huo-chu* is absolutely wrong. Only the fact that the word "fire" forms the first element in the names of both minerals suggested this hypothesis to the Chinese philologists. But there is a fundamental difference in characterizing the two by the attribute "fire." In mica it refers to that phenomenon known to us as asterism, — the exhibition of a starlike reflection, which occurs also in sapphire, chiefly displayed by some phlogopites when a candle-flame is viewed through a sheet of the mineral, — and the frequent use of the substance for windows, as remarked by Watt, may have facilitated the observation of this peculiar property. The fact that the Chinese were perfectly aware of it has already been demonstrated by the reference to the mica windows in the palaces of Lo-yang; and there is another similar report in the Records of Kuang-tung Province,² according to which the mica of

with that of light-reflection. The text itself, like the book from which it is taken, is apocryphal. The assigning of it to the Emperor Ling is a gross anachronism, and nothing is known about the country K'ü-sü.

¹ Windows of mica are mentioned in a *Description of the Palaces of Lo-yang* (*Lo-yang kung tien ki* 洛陽宮殿記; *T'ai p'ing yü lan*, Ch. 808). They spread a dazzling brilliancy in the sunlight. Also fans were made from the same substance by Shi Hu 石虎 (mentioned in his work *Yü chung ki* 鄴中記; see BRETSCHNEIDER, *Bot. Sin.*, pt. 1, No. 1079).

² *Kuang chun ki* 廣州記, by P'ei Yüan 裴淵, who lived under the Ts'in dynasty (265—419); see BRETSCHNEIDER, *Bot. Sin.*, pt. 1, No. 377.

the district of Tsêng-ch'êng, when struck by the sunlight, emits a brilliant light.¹

LIU-LI AND LANG-KAN NOT BURNING-LENSES. — We find also the opinion heralded by Li Shi-chên that the stone *liu-li* 琉璃 (Sanskrit *vaidūrya*) is identical with the *huo-ts'i* gem. This notion goes back to Ch'ên Ts'ang-k'i 陳藏器, who lived during the first part of the eighth century at San-yüan (in the prefecture of Siningan, Shen-si Province), and who is the author of the *Pên ts'ao shi i* 本草拾遺. This work seems to be lost; but extracts of it are preserved in the later works on natural history, notably in the *Chéng lei pên ts'ao* 證類本草 of the year 1108, and in the *Pên ts'ao kang mu*. In both works he is quoted as saying that, according to the dictionary *Tsi yün* 集韻, *liu-li* is the same as the gem *huo-ts'i*. This work, of course, is not the *Tsi yün* which was begun in 1034 and completed in 1039,² but the *Tsi yün* or *Yün tsi* by Lü Tsing 呂靜 of the Tsiu dynasty (265—419).³ We are here confronted with a purely philological opinion of a lexicographer, which is hardly founded on a personal examination of the objects concerned,⁴ nor is it very likely that Sanskrit *vaidūrya* ever referred to a variety of mica.

¹ 增城縣有雲母向日炤之光耀 (*T'ai p'ing yü lan*, Ch. 809). — The introduction of plate-glass has now supplanted the use of mica in Eastern Asia; but some curious survivals of it still occur in Tibet. The Tibetans manufacture an abundance of charm-boxes (*gam*), some of large dimensions in the form of shrines; a window is cut out in the metal surface to render the image in the interior visible. This window is now usually covered with European glass, but also with a transparent sheet of mica. Ornaments of mica are still employed by the women in the territory of the Kuku-nör for the decoration of their fantastic head-dresses.

² WATERS, *Essays on the Chinese Language*, p. 60.

³ See the Catalogue of Sui Literature (*Sui shu*, Ch. 32, p. 22; and WATERS, *l. c.*, p. 40). *T'ai p'ing yü lan* (Ch. 809, p. 2) quotes the same definition from the dictionary *Yün tsa* 韻雜, which presumably is a misprint for *Yün tsi* 韻集.

⁴ This discussion bears out the reasons which induced F. PORTER SMITH (*Contributions toward the Materia Medica of China*, p. 120) to identify *huo-ts'i* with lapis lazuli, as he took *liu-li* for the latter and encountered the equation of *huo-ts'i* with *liu-li*.

As the term *liu-li* refers to certain varieties of rock-crystal¹ and to certain vitreous products, it would be possible in theory that burning-lenses were made from this substance; but no such instance is on record. There is, however, an isolated case in which a specular lens of this material is in question.

In the year 499, the Buddhist monk Hwei Shên 慧深 returned to China under the pretence that he had visited a marvellous island in the farthest east, called Fu-sang 扶桑, and made a glowing report of its wonders. It is well known that a number of European and American scholars sought this alleged country Fu-sang in Mexico or somewhere else in America, and pretended that this continent had been discovered by the Chinese nine centuries before Columbus. Others, of a more sober trend of mind, localized Fu-sang on Sachalin or on islands near Japan. But even this moderate attitude rests on a cardinal error, for Fu-sang, as described by Hwei Shên, is not a real country at all, but a product of imagination, a geographical myth, composed of heterogeneous elements, as will be shown by me elsewhere. In this connection Fu-sang is of interest to us, as the earliest Chinese mention of a specular lens is associated with it. In the beginning of the sixth century envoys of Fu-sang are alleged to have appeared in China, "offering as tribute a precious stone for the observation of the sun (*kuan ji yū* 觀日玉), of the size of a mirror, measuring over a foot in circumference, as transparent as rock-crystal (*liu-li*); looking through it in bright sunlight, the palace-buildings could be very clearly distinguished."² The event

¹ It would be preferable to use the general term "quartz," as it is impossible to determine in each and every case what kind of crystal is intended.

· 扶桑國使使貢觀日玉。大如鏡。方圓尺餘。明澈如琉璃。映日以觀日 (variant: 見) 中宮殿皎然分明 (*T'ai p'ing yü lan*, Ch. 805, p. 10). This text is derived from the book *Liang se kung tse ki*, 梁四公子記, "Memoirs of the Four Lords of the Liang Dynasty

of the embassy here alluded to is apocryphal, for it is not on record in the official Annals of the Liang Dynasty; the country Fu-sang itself is an imaginary construction. Moreover, the work which contains this story, and which consists of conversations held by the four Lords¹ with the Emperor Wu of the Liang dynasty (502—549) has a decided tendency toward the wondrous, and teems with fables derived from the West. Notwithstanding, all this does not detract from the value of this first account of a specular lens, through which objects could plainly be beheld. I think that SCHLEGEL² was not so very wrong in lending expression to the opinion that this "precious stone for the observation of the sun" was a rock-crystal.

In his book (happily now forgotten) *Fusang or the Discovery of America by Chinese Buddhist Priests in the Fifth Century* (1875) CH. G. LELAND has utilized also this notice in support of his Fusang-American hypothesis, and has tried to establish an analogy between the observation glass of the Chinese account and the burning-mirrors of metal which the ancient Peruvians are alleged to have employed for kindling their sacred fire. BRETSCHNEIDER³ who banished the nightmare of Leland with as much critical acumen and as a solid fund of information refuted this particular point only by discounting the credibility of the Chinese source in question.⁴

(502—556)," written by Chang Yüe 張說 (667—730), statesman, poet, and painter (GILES, *Biographical Dictionary*, p. 51).

¹ They were Hwei-ch'uang 蜀闢, Wan-kie 霽免杰, Wei-t'uan 裴黃端, and Chang-ki 仇啓.

² *T'oung Pao*, Vol. III, 1892, p. 139.

³ *Über das Land Fu Sang (Mitt. d. Ges. Ostasiens*, Vol. II, No. 11, 1876, pp. 1—11).

⁴ He erroneously styled the work "the memoirs of a certain Liang sze kung." In his *Botanicon Sinicum* (pt. 1, p. 169) the title is correctly explained. In an old catalogue of books from the twelfth century, Bretschneider comments, this work is described as totally unreliable, as the author narrates mostly wondrous and incredible stories. This is merely a conventional Chinese mode of literary criticism. The wondrous stories of this book are of incalculable historical value to us, as many of them are exact reproductions of western legends.

This point of view is unnecessary. We certainly do not have to believe in the embassy from Fu-sang, which is not confirmed by the *Annals*; the instrument, however, described in the report cannot be a personal invention of Chang Yüe, the author of that work, but surely is a reality. It doubtless was a lens which permitted to see the distant palace-buildings with greater distinction; yet it was not a burning-lens, and the comparison drawn by Leland is far from the point. Moreover, the alleged burning-mirrors of the Peruvians existed merely in the imagination of Garcilaso de la Vega, whose fantasy has already been exploded by E. B. TYLOR.¹

It is possible to trace with some degree of probability the real origin of that lens fancifully associated with the mythical land Fu-sang. The work *Liang se kung tse ki* that contains this account offers the following interesting text: "A large junk of Fu-nan which had hailed from western India arrived (in China) and offered for sale a mirror of a peculiar variety of rock-crystal (碧玻璃鏡),²

¹ *Researches into the Early History of Mankind*, pp. 250—253 (New York, 1878).

² G. PAUTHIER (*L'inscription de Si-njan-fou*, p. 31, Paris, 1858), who first called attention to this text, was quite correct in explaining the term *p'o-li* as "rock-crystal." PÉLLIOT (*Bull. de l'École française*, Vol. III, p. 283) accepts *p'o-li* in this passage in the sense, commonly adopted, of "glass," while admitting that it etymologically corresponds to Sanskrit *sphatika*. The latter, however, means "rock-crystal;" and in my opinion the Chinese word *p'o-li*, derived from it, in the greater number of ancient texts, has the same significance. Evidence based on other texts will be produced farther below; here we discuss only the text under consideration. For two weighty reasons it is impossible to regard the mirror mentioned in the *Liang se kung tse ki* as a glass mirror. First,—the story of the merchants, which is an echo of the Western legend of the Diamond Valley, reveals the fact that the question is of a precious stone, not of glass; among the numerous versions of this legend, there is not one that speaks of glass, but all of them are unanimous in mentioning hyacinths, diamonds, or precious stones in general. A plain glass mirror, most assuredly, would not have been priced so highly, nor have caused such a sensation, nor have been linked with a legend of that character. Second,—glass mirrors were not yet invented at that time in the West, and for this reason the conclusion that they should have been known in India and Fu-nan during the sixth century seems to me very hazarded. True it is that HIRTH (*Chinese Metallic Mirrors*, *Boas Ann. Vol.*, p. 219), who also regards this mirror from Fu-nan as being of "green glass" (see, however, also the following footnote), and who wonders at the incredible price solicited for it, supports his theory by

one foot and four inches across its surface, and forty cattles in weight. It was pure white and transparent on the surface and in the interior, and displayed many-colored things on its obverse. When held against the light and examined, its substance was not discernible.¹ On in-

the statement that the ancients were acquainted with glass mirrors. This argument, however, is not valid; we have to study only the famous and ingenious treatise of J. BECKMANN (*Beiträge zur Geschichte der Erfindungen*, Vol. III, particularly pp. 302—335; an English translation of this monumental work was published in 1814 by W. JOHNSTON) to become thoroughly convinced of the baselessness of Hirth's claim; and the result of Beckmann, who wrote in 1792, is upheld both by classical philology (MORGAN, *Harvard Studies in Classical Philology*, Vol. 1, 1890, pp. 50—51) and by the modern history of technology (FELDHAUS, *Technik der Vorzeit*, col. 1044). The plain fact remains that real glass mirrors in our sense did not come up in Europe before the latter part of the thirteenth century, and that they did not exist in classical antiquity. — I do not deny, of course, that in a later period the term *p'o-li* assumed the meaning of "glass;" the exact date remains to be ascertained.

¹ HIRTH and ROCKHILL (*Chau Ju-kua*, p. 228), who have translated merely the beginning of this text on the basis of an incomplete quotation in *T'u shu tsi ch'êng*, render this sentence, "Objects of all kinds placed before them [the mirrors] are reflected to the sight without one's seeing the mirror itself." Even if this translation were admissible, which I venture to doubt, I am at a loss to understand what it should mean; it even seems to convey the meaning of something that is impossible. The sentence 置五色物於其前 (see the complete text of the passage on p. 202, note 3) cannot be linked with the following 向 etc, which is a new sentence expressing a new idea. This may be inferred also from the text, as quoted in *P'ên ts'ao kang mu*, in which the sentence beginning with 置 etc. is omitted, while the sentence beginning with 向 etc. is completely reproduced. Objects are certainly not placed in front of a mirror to be seen, but man wants to behold himself or objects in a mirror. It is obvious that the objects here mentioned were natural designs formed by zones of various colors in the stone. As they were not acquainted with the complete text, as handed down in *T'ai p'ing yü lau*, Hirth and Rockhill understand that the junks of Fu-nan habitually sell such mirrors to the Chinese. Our story renders it clear that only an isolated instance comes into question, and that this particular, unusual mirror could not even be disposed of in China. The *Liang se kung tse ki* is not a work on commercial geography summarizing general data, but a story-book narrating specific events. We have in the present case not a description, but a narrative. For the rest, however, the notes contributed by Hirth and Rockhill on the history of glass are very interesting and valuable, though many problems connected with this difficult subject still remain unsolved. Hirth's opinion, that *pi-p'o-li* should be regarded as a word-formation prompted by analogy with *pi-liu-li*, is very plausible. Our text indeed renders this conception almost-necessary, as the word *pi* cannot be taken here in the sense of "green," the substance of the mirror being described as white and transparent.

quiry for the price, it was given at a million strings of copper coins. The Emperor ordered the officials to raise this sum, but the treasury did not hold enough. Those traders said, 'This mirror is due to the action of the Devarāja of the Rūpadhātu.¹ On felicitous and joyful occasions, he causes the trees of the gods² to pour down a shower of precious stones, and the mountains receive them. The mountains conceal and seize the stones, so that they are difficult to obtain. The flesh of big beasts is cast into the mountains; and when the flesh in these hiding-places becomes so putrefied that it phosphoresces, it resembles a precious stone. Birds carry it off in their beaks, and this is the jewel from which this mirror is made.' Nobody in the empire understood this and dared pay that price."³

The story connected in this report with the crystal mirror is a somewhat abrupt and incomplete version of the well-known legend of the Diamond Valley, the oldest hitherto accessible Western version

¹ 色界天王 ("the Celestial King of the Region of Forms"). The Rūpadhātu is the second of the three Brahmanic worlds. The detailed discussion of this subject on the part of O. FRANKE (*Chinesische Tempelschrift*, pp. 47—50) is especially worth reading. The Devarājs here in question is Kubera or Vaiçravaṇa, God of Wealth, guarding the northern side of the world-mountain Sumeru and commanding the host of the aerial demons, the Yukeha.

² 天樹. This term corresponds to Sanskrit *devataru*, a designation for the five miraculous trees to be found in Indra's Heaven (compare HOPKINS, *Journ. Am. Or. Soc.*, Vol. xxx, 1910, pp. 352, 353).

³ 梁四公記。扶南大船從西天竺國來賣碧玻瓈鏡面廣一尺四寸重四十斤。內外皎潔置五色物於其前。向明視之不見其質。問其價豹錢百萬貫文。帝令有司算之以府庫當之不足。其商人言。此色界天王。有福樂事天樹大雨雨衆寶山納之。山藏取之難得。以大獸肉投之。藏中肉爛類寶一。鳥銜出而此寶焉。舉國不識無敢酬其價者 (*T'ai p'ing yü lan*, Ch. 808, p. 6).—The narrative is obscure in omitting to state that the jewels adhere to the flesh which is devoured by the birds.

of which is contained in the writings of EPIPHANIUS, Bishop of Constantia in Cyprus (circa 315—403).¹ Again, it is the author of that curious work, *Liang se kung tse ki*, who has preserved to us the earliest Chinese form of this legend which strikingly agrees with the story of Epiphanius. This text is worded as follows: "In the period T'ien-kien (502—520) of the Liang dynasty, Prince Kie of Shu (Sze-ch'uan) paid a visit to the Emperor Wu,² and, in the course of conversations which he held with the Emperor's scholars on distant lands, told this story: 'In the west, arriving at the Mediterranean,³ there is in the sea an island of two hundred square miles (*li*). On this island is a large forest abounding in trees with precious stones, and inhabited by over ten thousand families. These men show great ability in cleverly working gems,⁴ which are named for the country Fu-liu 拂林.⁵ In a northwesterly direction from

¹ *Epiphanii opera*, ed. DINDORF, Vol. iv, p. 190 (Leipzig, 1862). On the basis of these new Chinese sources, I have treated the history of this legend in detail in a study on the diamond (unpublished manuscript of the writer), and therefore do not pursue the subject further on this occasion.

² He was the first emperor of the Liang dynasty and lived from 464 to 549 (GILES, *Biographical Dictionary*, p. 285).

³ *Si hai* 西海 (the "Western Sea"). Compare HIRTH, *Journ. Am. Or. Soc.*, Vol. XXXIII, 1913, p. 195.

⁴ This must be referred to the cutting and engraving of antique intaglios (gems in the sense of Latin *gemma*).

⁵ The same mode of writing (林 instead of the later 森) as that encountered by CHAVANNES (*T'oung Pao*, 1904, p. 38) in a text of 607, extracted from the *Ts'c fu yüan kuei*. The same way of writing occurs also in *Yu yang tsa tsu* and in a poem of the T'ang Emperor T'ai-tsung (*P'ei wén yüen fu*, Ch. 27, p. 25). As our text speaks of a forest of jewelled trees, a popular interpretation of the name Fu-lin apparently is intended here, "forest" (林) of the jewels being read into Fu-lin; as if it were "forest of Fu." We are here confronted with the earliest allusion in Chinese records to the country Fu-lin, antedating our previous knowledge of it by a century, Hirth having traced the first appearance of the name to the first half of the seventh century. The reference to the period T'ien-kien (502—520), and the mention of the Liang Emperor Wu, are exact chronological indications which now carry Chinese acquaintance with Fu-lin to the beginning of the sixth century. This result perfectly harmonizes with the view expressed by PÉLIOT (*Journal asiatique*, Mars-Avril, 1914, p. 498), that the name Fu-lin appears with certainty about 550, and that it is possibly still older.

the island is a ravine hollowed out like a bowl, more than a thousand feet deep. They throw flesh into this valley. Birds take it up in their beaks, whereupon they drop the precious stones. The biggest of these have a weight of five catties.' There is a saying that this is the treasury of the Devarāja of the Rupadhatu."¹ This is not the occasion to discuss the history and development of this interesting legend in connection with its Arabic and subsequent Chinese parallels; this will be done by me in another place. Suffice it to say for the present that the Chinese version is an exact parallel to that of Epiphanius, that it antedates all Arabic versions, that it represents a purer form than the earliest Arabic text in the *lapidarium* of Pseudo-Aristotle, and that it was transmitted to China directly from Fu-lin. I have here fallen back on these two texts of the *Liang se kung tse ki* to introduce the reader to the mental horizon of its author, Chang Yüe, and thus to secure a basis for judging the *raison d'être* of the specular lens ascribed by him to an embassy from Fu-sang. It was a plausible *a priori* supposition that this instrument must have been one of Western manufacture; and being now familiar with the outfits and tools of the workshop of Chang Yüe, who absorbed traditions of Fu-nan, India, and Fu-lin, we may well infer that the alleged Fu-sang lens was really a

梁四公記。梁天監中有蜀杰公謁武帝嘗與諸儒語及方域。西至西海海中有島方二百里。島上有大林。林皆寶樹中有萬餘家。其人皆巧能造寶器所謂拂林國也。島西北有坑盤坳深千餘尺。以肉投之。鳥銜寶出大者重五斤。彼云是色界天王之寶藏 (T'u shu tsi ch'ing,

section on national economy 321, 寶貨, *tsung pu ki shi*, p. 5). — The last sentence, of course, is not an element inherent in the story, as it came from Fu-lin, but is an interpolation of the Chinese author Chang Yüe, taken from the narrative which the traders of Fu-nan had overheard in India.

product of Syria (Fu-hu) and reached China possibly by way of India and Cambodja (Fu-nau), in the same manner as the costly mirror of rock-crystal.¹

A product termed *lang-kan* 琅玕 is identified with *huo-ts'i* by Su Kung 蘇恭 of the T'ang period,² who, at the same time defines the former as a kind of *liu-li*. K'ou Tsung-shi 寇宗奭, in his *Pên ts'ao yen i* 本草衍義 of 1116, calls him to task for this wrong statement by observing that *liu-li* is a substance evolved by fire, while *lang-kan* is not, so that the two could not represent identical species. Su Kung's identification has indeed not been adopted by any subsequent Chinese scholar.³

¹ In the writer's proposed Chinese-Hellenistic studies will be found several interesting examples of Hellenistic folk-lore traditions looming up in Fu-nan and thence transmitted to China.

² *Chéng lei pên ts'ao*, Ch. 5, fol. 26. Also in a commentary to the dictionary *Ki ts'iu pien* 急就篇 (*P'ei wén yün fu*, Ch. 7 A, p. 106 b).

³ *Lang-kan*, in times of antiquity, appears as a mineral, mentioned already in the earliest Chinese document, the tribute of Yü, in the *Shu king* (LEGGE, *Chinese Classics*, Vol. III, p. 127), as a product of the province of Yung-chou; its exact nature cannot be determined, the commentators saying no more than that it was a stone used for beads; Legge's explanation that possibly it was lazulite or lapis lazuli, is purely conjectural. The *Shuo wén* defines *lang-kan* as a stone resembling jade; and the *Erh ya* localizes it in the K'un-luu. The *Pie lu* 別錄 assigns the stone to P'ing-tsü 平澤 in Shu 蜀 (Sze-ch'uan). *Wei liö*, *Hou Han shu*, *Liang shu*, and *Wei shu* (HIRTH, *China and the Roman Orient*, pp. 41, 47, 50, 73) mention *lang-kan* among the products of Ta Ts'in; no explanation of its significance with reference to these passages is on record. We find *lang-kan* also in Kucha (*Liang shu*, Ch. 54, p. 14), in central India (*ibid.*, p. 7 b), and generally in India (*T'ang shu*, Ch. 221 A, p. 10 b). From the T'ang period onward the Chinese naturalists or pharmacists, beginning with Ch'ên Ts'ang k'ü, describe *lang-kan* as a kind of coral, growing like a tree with root and branches on the bottom of the sea, fished by means of nets, and being reddish, when coming out of the water, but subsequently turning darker. The *Yün lin shi p'u* (Ch. c, p. 9 b) says that it is a stone caught in shallow places near the coast of Ning-po, resembling the genuine coral (*shan-hu*), being white, when coming out of the water, and afterwards turning purple or black. Li Shi-chên objects to the application of the term *lang-kan* to these marine products which, according to him, should be credited with the name *shan-hu*, while the former should be restricted to a stone occurring in the mountains. Compare also SCHLEGEL, *T'oung Pao*, Vol. VI, 1895, p. 58; F. DE MÉLY, *Lapidaires chinois*, p. 56; HIRTH and ROCKHILL, *Chau Ju-kua*, pp. 162, 226. The word *lang-kan* seems to be an onomatopoeic formation descriptive of the

THE MINERALOGICAL TERM MEI-HUI. — Finally we have to discuss the term *mei-hui* 玫瑰, which, according to Li Shi-chên, also should refer to lenses. It first appears in the poem *Tse hiü fu* 子虛賦 of Se-ma Siang ju, who died in 117 B.C., as one of the mineral products of Sze-ch'uan.¹ Kuo P'o (275–324) explains it as a stone bead 石珠; Tsin Pao 晉灼 says that it is identical with *huo-ts'i* beads; and Yen Shi-ku (579–645) reiterates the same, adding that "is is the 'fire-pearl' coming at present from the countries of the south."² These definitions are vague and unsatisfactory, being made by philologists who in all probability had never seen any of the stones in question. Yen Shi-ku errs in identifying *huo-ts'i* with *huo-chu*, and therefore the identification of both with *mei-hui* is presumably wrong also. The dictionary *Shuo wen* (A.D. 123) notes *huo-ts'i* as an equivalent or synonyme of *mei-hui*; as we have shown that the former covers the group of micas, it would follow from this definition, provided it is correct, that *mei-hui* should be a variety of mica, and consequently cannot be a burning-lens.

The term *mei-hui* is listed also in the ancient vocabulary *Ki tsiu chang* 急就章, edited by Shi Yu 史游 under the reign

sound yielded by the sonorous stone when struck (compare the words *lang* 硠, "rumbling of stones, roll of a drum;" and *lang* 朗, "clear, as light or sound;" *lang-t'ang* 朗鐘 is used in Peking as an interjectional expression, imitative of the noise of gongs and drums; in general compare chap. IV of WATTERS, *Essays on the Chinese Language*). This point of view would account for the fact that the name *lang-kan* was transferred from a stone to a coral; for Tu Wan, in his *Yün lin shi p'u* (l. c.), expressly states that the coral *lang-kan* when struck develops resonant properties.

¹ *Shi ki*, Ch. 117, p. 2 b; and *Ts'ien Han shu*, Ch. 57 A, p. 2 b. Yen Shi-ku defies the pronunciation of the two characters as *mei* and *hui* (or *huai*), but admits for the latter also the sound *kuei* (玫音枚。瑰音回。又音瓌).

² 火齊珠。今南方之出火珠也。 This clause is interesting, inasmuch as it proves the importation of lenses into China in the first half of the seventh century,—a fact which, as will be seen, is confirmed by the T'ang Annals.

of the Emperor Yüan (48–33 B.C.),¹ with reference to jars made from this stone and three others. It is simply defined as “fine jade” in the commentary. This explanation, again, would banish any idea of burning-lenses.²

What the *mei-hui* mentioned by Se-ma Siang-ju was, no Chinese commentators really knew. Their explanations are makeshifts to conceal their lack of proper knowledge of the subject. This much seems certain, that the *mei-hui* of Sze-ch'uan was not mica (*huo-ts'i*), first, because mica is not known to occur there; and, second, because the name *mei-hui* denotes also the rose,³ and accordingly the mineralogical term seems to refer to a rose-colored stone. For this reason it seems out of the question also that it could have been used as a lens, and there is indeed no account to this effect, mentioning the employment of *mei-hui*. The case, therefore, is one of purely literary extension of significance. The original meaning of the word having fallen into oblivion, it

¹ Regarding this work see the important study of CHAVANNES, *Documents chinois découverts par Aurel Stein*, pp. 1–10. The passage referred to is in *Pien tse lei pien*, Ch. 70, p. 13 b.

² The apocryphal work *Shu i ki*, of the sixth century, which has not come down to us in its original form, is credited with the statement, “Snake-pearls are those vomited by a snake. There is a saying in the districts of the Southern Sea (Kuang-tung, etc.) that a thousand snake-pearls are not the equivalent of a single *mei-hui*, which means that snake-pearls are low in price. Also *mei-hui* is the designation of a pearl (or bead, jewel).”

³ *Rosa rugosa*, with red and pink flowers (G. A. STUART, *Chinese Materia Medica*, p. 381; and M. J. SCHLEIDEN, *Die Rose, Geschichte und Symbolik*, p. 228, who enumerates several species of rose in China). The Japanese naturalist Ono Ranzan states that the precious stone *mei-hui* is named for the color of the flowers of *Rosa rugosa*, and invokes the Chinese work *T'ien kung k'ai wu* 天工開物 by Sung Ying-sing of 1628 (2d ed., 1637), as his authority (GEERTS, *Produits de la nature japonaise et chinoise*, Vol. II, p. 360). I cannot trace this reference in the latter work, but find there that *mei-hui* is treated as a special kind of precious stone “resembling yellow or green peas; the biggest are red, green, blue, yellow, in short, occurring in all colors; and there are also *mei-hui* like pearls” (see *T'u shu (si ch'ung*, chapter on precious stones, *pao shi*). Yet I am convinced that Ono Ranzan encountered this statement in some Chinese book, and may have erred only in quoting the *T'ien kung k'ai wu*.

became free to assume the same meaning as *huo-ts'i*, in the rôle of an elegant term of the *estilo culto*. The fact that it really interchanges with the latter is manifested by the account of Persia in *Nan shi*,¹ where *mei-hui* are listed among the products of that country: while, as mentioned on p. 195, the analogous reports in *Pei shi*, *Wei shu* and *Sui shu* have the term *huo-ts'i* in the same passage. Thus the greatest probability is that also *mei-hui*, as used in this text of the *Nan shi*, denotes the mica of India. As regards other foreign countries, we find *mei-hui* mentioned in the *Wei lio*, written by Yü Huan between 239 and 265, as a product of the Roman Orient ('Ta Ts'iu),² and worn on the high head-dress of the women of the King of the Ephtalites (Ye-ta).³

After having overthrown the nebular hypotheses of foreign and Chinese scholars, the path is finally cleared for discussing the real thing, the history of burning-lenses in China. There is only one term in the Chinese language which may lay claim to having this significance, and that is *huo chu* 火珠 (the "fire-pearl").

INTRODUCTION OF BURNING-LENSES INTO CHINA. — The first historical mention of "fire-pearls" (*huo chu*) is made in the Annals of the T'ang Dynasty (618—906),⁴ where they are connected with a tribe of Malayan or Negrito stock, styled "Lo-ch'a" 羅刹, and inhabiting an island in the Archipelago east of P'o-li 婆利 (Bali). "Their country," it is said, "produces fire-pearls in great number, the biggest reaching the size of a fowl's egg. They are round and white, and emit light at a distance of several feet. When held

¹ Ch. 79, p. 8.

² HIRTH, *China and the Roman Orient*, p. 73.

³ *Lo-yang kia lan ki* 洛陽伽藍記, written in 547 by Yang Hsün-chi 楊衒之 (quoted in *T'u shu (si ch'eng, Pien i tien* 67, Ye-ta, hui k'ao 2).

⁴ *T'ang shu*, Ch. 222 c, p. 1 b.

against the rays of the sun, mugwort¹ and rushes² will be ignited at once by fire springing from the pearl."³ The same text, with slightly varying phraseology, is given also in the *Old History of the Tang Dynasty*,⁴ where, however, the interesting addition occurs, that this pearl is in appearance like crystal (狀如水精). Hence we may justly conclude that these fire-pearls were convex crystal lenses, whose optical properties were utilized in producing fire for the medical purpose of cauterization.⁵

¹ Chinese *艾*, *Artemisia vulgaris*, a plant common in China and from ancient times used in cauterizing the skin (see BRETSCHNEIDER, *Bot. Sin.*, pt. 2, No. 429; pt. 3, No. 72),—a process known to us by the Japanese name *moxa* (properly *mogusa*, the Jap. word for *Artemisia*). The best leaves are taken and ground up with water in a stone mortar, the coarsest particles being eliminated, and the remainder being dried. A small portion is rolled into a pellet the size of a pea, placed upon the ulcer or spot to be cauterized. The preferred method of igniting the *moxa* is still by means of a burning glass or mirror (compare G. A. STUART, *Chinese Materia Medica*, p. 53). The most interesting and detailed account of this practice was written by ENGLBERT KAEMPFER in the seventeenth century (*History of Japan*, Glasgow edition, Vol. III, pp. 277—292). Kaempfer states that the Japanese used burning splinters or incense-sticks to ignite the *moxa*.

² KAEMPFER (*l. c.*, p. 276) informs us that the most common caustic used by the Brahmins of India is the pith of rushes, which grow in morassy places. This pith they dip into sesamum-seed oil, and burn the skin with it after the common manner.

³ 多火珠。大者如雞卵。圓白照數尺。日中以艾藉珠輒火出。

⁴ *Kiu T'ang shu*, Ch. 197, p. 1 b.

⁵ GROENEVELDT (*Notes on the Malay Archipelago*, p. 206, in *Miscell. papers relating to Indo-China*, Vol. 1), who was the first to indicate the relevant passage of the *T'ang shu* (but neglected the corresponding text of the *Kiu T'ang shu*), was therefore wrong in affirming that the fire-pearl is "evidently a kind of burning-glass, but whether of glass or crystal, and manufactured in what place, we have no means to ascertain." We have, as will be seen farther on, the means of ascertaining that these crystal lenses were manufactured in India. Another error of Groeneveldt was to assign the fire-pearls to the country of P'o-li instead of Lo-ch'a. PELLIOT (*Bull. de l'Ecole française*, Vol. IV, p. 283, note 3) has clearly pointed out the confusion prevailing in this chapter of the *T'ang Annals*, and has shown that it was the wild men of Lo-ch'a visiting the coasts of Champa in order to sell these crystal lenses, carrying on their trade at night, while hiding their faces during the day (*ibid.*, p. 281, but he too speaks of "lentilles de verre"). G. SCHLEGEL (*Toung Pao*, Vol. IX, 1898, p. 178; and 1901, p. 334), who revealed the same text from the Chinese Gazetteer of Kuang-tung Province, offered the inadequate translation, "Their country produces car-

The crystal lenses, accordingly, were employed in the same manner as the burning-mirrors of copper or bronze in a former period. The *Ku kin chu* 古今注¹ of Ts'uei Pao 崔豹 of the fourth century states that the latter served for the purpose of setting mugwort on fire.²

The Annals of the Tang Dynasty indicate also the fact that in 630 King Fan-t'ou-li 范頭黎 sent an embassy to China to present such lenses.³ It is this text of the Tang Annals which gave to Li Shi-chên occasion for his general statement of the subject, as quoted above. We now observe that he has cited the text inaccurately, and has credited it with the term *huo-ts'i-chu* instead of *huo chu*. The former, however, as we have seen, denotes mica, which cannot be used for lenses; the latter relates to rock-crystal; and it is essential to discriminate between the two. Likewise it is not to the point when he asserts that the lenses now found in Champa are styled "great fire-pearls of the morning dawn." "Morning dawn" (*chao hia*) is well known to us as the designation of a specific textile fabric;⁴ and in the passage of the Tang Annals indicated it happens that the two terms "morning-dawn cloth" and "fire-pearl" (*chao hia pu huo chu* 朝霞布火珠) are closely joined, hence arose, apparently, the misunderstanding of Li Shi-chên.

buncles (*huo chu*) which are like crystals." Carbuncles certainly are not like crystals, nor can they be utilized as optical lenses. C. PUINI (*Enciclopedia sinico-giapponese*, p. 65, Firenze, 1877) had already indicated that *huo chu* is a species of quartz.

¹ Ch. c, p. 5 b (ed. of *Han Wei Ts'ung shu*).

· 陽燧以銅爲之。形如鏡。何日則火生以艾承之則得火也。

² The last clause in the definition of these is worded in the *Old History* thus: "When held against the sun at noon in order to ignite mugwort, the latter is consumed by fire" (正午向日以艾蒸之即火燃)。

³ PELLLOT, *T'oung Pao*, 1912, p. 480; GILES, *Adversaria Sinica*, p. 394; LAUFER, *T'oung Pao*, 1913, pp. 339, 340; *Ling-wai tai ta*, Ch. 6, p. 13.

A book entitled *Sui T'ang kia hua* 隋唐佳話¹ informs us that in the beginning of the period Chêng-kuan (627—650) the country Champa (Lin-yi) offered to the Court burning-lenses (*huo chu*), in appearance like rock-crystal, stating that the people of Champa had obtained them from the Lo-ch'a country, whose inhabitants have red hair, a black skin, teeth like animals, and claws like hawks.²

The Lo-ch'a or Rākshasa, who, judging from the unflattering description of the Chinese, were a wretched, savage tribe (but sufficiently advanced to practise navigation and to trade with Champa),

¹ Quoted in *Pien tse lei pien*, Ch. 21, p. 5 b.

² Chinese *Lo-ch'a* is the transcription of the Sanskrit word *Rākshasa*. The latter is the designation for a class of man-devouring ogres with red neck and eyes, and protruding tusks, roaming about at night and doing mischief to mankind. It was believed by Groeneveldt and Schlegel that the country of the Lo-ch'a mentioned in the T'ang Annals is identical with the Nicobar Islands; but PELLIOU (*Bull. de l'Ecole française*, Vol. IV, p. 281) has rightly demonstrated the baselessness of this theory, with the result that the country of the Lo-ch'a in question was situated east of P'o-li, which is identical with Bali, the island east of Java. GERINI (*Researches on Ptolemy's Geography of Eastern Asia*, p. 497) likewise has antagonized that theory, arguing that Lo-ch'a refers to the more southern parts of the Malay Peninsula, and perhaps stands also for the wilder tribes of Negrito-Sakai stock populating its eastern coast; but this opinion conflicts with the Chinese accounts of Lo-ch'a. In the belief of the Indians, the main abode of the Rākshasa demons was Ceylon (Langka), which for this reason was styled also Rākshasālaya ("Abode of the Rākshasa"); and as such, Ceylon appears in the great epic poem Rāmāyaṇa, in which King Rāma combats these fierce devils of Ceylon. A country of the Rākshasa plays a signal rôle in the Tibetan cycle of legends clustering around Padmasambhava, who lived in the eighth century (see E. SCHLAGINTWEIT, *Lebensbeschreibung von P.*, I, p. 21; and LAUFER, *Roman einer tibetischen Königin*, p. 224). It would be tempting to regard the Lo-ch'a as a tribe like the Vedda of Ceylon, but for geographical reasons it is assuredly impossible to place the Lo-ch'a on Ceylon. Such a nickname as Rākshasa could certainly have been applied by the superior castes of India to any inferior aboriginal tribes (compare the note of YULE, in his *Marco Polo*, Vol. II, p. 312, regarding a Brahman tradition that the Rākshasas had their residence on the Andamans, and the analogous application in India of the words *Nāga* and *Piçāca*). Indian traditions referring to Rākshasa tribes, therefore, cannot assist us toward the identification of the Lo-ch'a country of the T'ang period, which, as justly upheld by Pelliot, was an island in an easterly direction from Bali. It may be supposed that it was the highly cultivated peoples of Java and Bali who conferred the name "Rākshasa" on that primitive tribe in their proximity.

certainly were themselves not able to produce fire-making lenses.¹ From what quarters was their supply derived? We are informed by the Annals of the T'ang Dynasty that in the year 641 Magadha in India sent to the Chinese Court tribute-gifts among which appeared fire-lenses (*huo chu*),² and, further, that Kashmir produces fire-lenses, saffron, and horses of the dragon breed.³ The latter notice is contained also in the memoirs written by the celebrated pilgrim Hsuan Tsang in 646;⁴ and his statement, based on actual observation, was doubtless the source from which the official history of the T'ang dynasty drew. The Arabic mineralogists also — as, for instance, al-Akfānī — knew Kashmir as a country producing rock-crystal.⁵

In the beginning of the period K'ai-yüan (713—742) Kashmir sent as tribute "pearls of supreme purity" (*shang ts'ing chu* 上清珠), illuminating an entire house with their splendor.⁶ Possibly also in this case crystal lenses are understood.

I Tsing, the Buddhist monk and traveller, who journeyed in India from 671 to 695, observes, "It is only in China where stones are internally taken as medicine. Since rock-crystal and marble emit

¹ GERINI (*l. c.*, p. 491), who erroneously locates the Lo-ch'a on the east coast of the southern portion of the Malay Peninsula, conjectures with reference to these crystal lenses that rock-crystal "very likely" occurs in that region. This point of view is quite immaterial. Whether rock-crystal is found there or not, the Lo-ch'a certainly did not quarry it; and if they did, it was not wrought by them into lenses. Quartz, for instance, is common on the Andamans, but the natives make it only into chips or flakes used in shaving or tattooing, while even the art of eliciting fire from the stone by means of striking is wholly unknown to them (E. H. MANN, *Journ. Anthropol. Inst.*, Vol. XII, 1883, p. 381).

² *T'ang shu*, Ch. 221 A, p. 11.

³ *T'ang shu*, Ch. 221 u, p. 6. Compare CHAVANNES, *Documents sur les Ton-kin occidentaux*, p. 166.

⁴ JULIEN, *Mémoires sur les contrées occidentales*, Vol. I, p. 167, who translates "glass lenses"; and WATTERS, *On Yuan Chwang's Travels in India*, Vol. II, p. 261.

⁵ WIEDEMANN, *Zur Mineralogie im Islam*, p. 206. Al-Akfānī died in 1348.

⁶ *Tu yang tsa pien* by Su Ngo, Ch. A, p. 3 (ed. of *Pai kai*).

sparks of fire, the organs of the body, if those stones are administered, may be scorched and ripped open. Many of our contemporaries, being unaware of this fact, have suffered death in consequence of this wrong treatment."¹ In Chinese alchemy preparations made from jade and mica played a signal part, and were consumed by ambitious devotees to insure long life or immortality.² When crystal lenses made their appearance in China, the belief was naturally fostered that fire was a substance inherent in the stone. Fire was considered as an element belonging to the male, creative, and life-giving principle called *yang*, so that a mineral partaking of it was apt to strengthen the body and to prolong life. The evil effect of the internal application of rock-crystal, as conceived by I Tsiang, thus becomes intelligible: in the same manner as a crystal lens can set fire to an object, so it may cause the human body to catch fire.

The information given in the T'ang Annals with regard to the Lo-ch'a originated from the mission which carried Ch'ang Tsiün 常駿 in the year 607 into the country Ch'i-t'u 赤土. On his journey he is said to have reached the country of the Lo-ch'a, while in another passage it is stated that owing to this mission the inhabitants of the Lo-ch'a country entered into relations with China.³

¹ *Nan hai ki kwei nei fa chuan*, Ch. 3, p. 20 (ed. of Tokyo); compare J. TAKAKUSU (*Record of the Buddhist Religion*, p. 135), who wrongly takes the term *pai shi* 白石 (literally, "white stone") for adular, which does not occur and is unknown in China; *pai shi* repeatedly appears in the votive inscriptions on Buddhist marble sculptures of the T'ang period, and is still the current expression for "marble." It would be possible that I Tsiang employed the term *pai shi* as a rendering of Sanskrit *śilopala* ("white stone"), which is a synonym of *sphaṭika* and accordingly a variety of quartz or rock-crystal (R. GARBE, *Die indischen Mineralien*, p. 87). Takakusu speaks of "the swallowing of a stone;" the stones were of course triturated and powdered, the mass was kneaded and prepared with other ingredients.

² Under the Sui (589—618) was still extant a treatise on the Method of Prescriptions in administering Jade (*Fu yü fang fa* 服玉方法). See *Sui shu*, Ch. 34, p. 21.

³ PELLINOT, *Bull. de l'École française*, Vol. iv, p. 281.

The latter statement seems to be the more probable of the two. The date 607 may thus be fixed as the time when the Chinese made their first acquaintance with burning-lenses; and during the first part of the seventh century a somewhat lively trade in the article was carried on from Champa to China. Hence Yen Shi-ku (579—645), as mentioned, justly points to the importation of burning-lenses from the south during his time. While, as a last resort, the Lo-ch'a lenses are traceable to India, we have as yet no means of ascertaining through what channels these lenses were transmitted from India to the Lo-ch'a. At this point there is a lacune in our knowledge which I am unable to fill; it may be supposed only that Sumatra or Java, or both countries, acted as middlemen in this traffic, but I regret having no certain facts along this line to offer.

It is curious that a tribe of such a low degree of culture as the Lo-ch'a possessed burning-lenses, and was instrumental in conveying this Indian article to Champa and China. This fact we may explain from ethnographical conditions of the present time, with which we are familiar: the Lo-ch'a, though acquainted with natural fire and its uses, must have been a tribe that did not know of any practical method of producing fire. Such a people, for example, we meet among the Andamanese, of whom E. H. MAN¹ says, "The Andamanese are unable to produce fire, and there is no tradition pointing to the belief that their ancestors were their superiors in this respect. As they live in the vicinity of two islands, one of which contains an extinct, and the other an active volcano, it seems not unreasonable to assume that their knowledge of fire was first derived from this source. Being strangers to any method of producing a flame, they naturally display much care and skill in the

¹ *Journ. Anthropol. Inst.*, Vol. xi, 1882, p. 272; compare also Vol. xii, 1883, p. 150.

measures they adopt for avoiding such inconvenience as might be caused by the extinction of their fires. Both when encamped and while journeying, the means employed are at once simple and effective. When they all leave an encampment with the intention of returning in a few days, besides taking with them one or more smouldering logs, wrapped in leaves if the weather be wet, they place a large burning log or faggot in some sheltered spot, where, owing to the character and condition of the wood invariably selected on these occasions, it smoulders for several days, and can be easily rekindled when required." Nothing introduced by the English so impressed this people with the extent of their power and resources as matches. It is notable also that the household fire is not held sacred by the Andamanese, or regarded as symbolical of family ties, and that no rites are connected with it; there are not even beliefs with reference to its extinction or pollution. The Lo-ch'a must have lived under exactly the same conditions when burning-lenses were first introduced among them from India. Not familiar with any practical method of fire-making or any fire-ceremonial, they readily took to this easy expedient, as the modern Andamanese did to our matches. It is still the primitive tribes spending most of their time in the open air, like the Lepcha and Tibetans (see below), who evince a predilection for the application of the burning-lens in fire-making.

Besides the name *huo chu* 火珠, the term *huo sui chu* ("fire-igniting lens") is found in the *Chêng lei pén ts'ao*, completed by T'ang Shên-wei in 1108.¹ From the same work it follows also

¹ 火燧珠向日取得火 (*Chêng lei pén ts'ao*, Ch. 3, fol. 44, edition of 1523). This is the concluding sentence of a brief notice on *p'o-li* (see above, p. 200). Both the *Chêng lei* and the *Pén ts'ao kang mu* accept this term in the sense of "rock-crystal" (*sphatika*), Li Shi-chên giving as synonyme the term *shui yü* 水玉, which appears in the *Shan hai king* and in the poem on the Shang-lin Palace 上林賦

that burning-lenses were manufactured in China under the Sung. Whether this was the case under the T'ang I am unable to say.

BURNING-LENSES IN INDIA AND SIAM. — The preceding Chinese accounts are clear enough to allow the inference that the so-called "fire-pearls" were lenses of rock-crystal cut into convex shape, that they were used for cauterization in the same manner as reported by Pliny, and that they were introduced into China, through the medium of the Lo-ch'a and of Champa, from Kashmir, or other regions belonging to the culture-zone of India. In short, what the

of Se-ma Siang-ju: its transparency, he says, equals that of water, its hardness that of jade, hence this term; the name "water-jade" is identical with rock-crystal (其瑩如水。其堅如玉。故名。水玉與水精同名)。The opinion of both T'ang Shên-wei and Li Shi-chên goes back to Ch'ên Ts'ang-k'î of the T'ang period, whose definition of *p'o-li* is as follows: "*P'o-li* is a precious stone of the Western countries. It belongs to the category of hard stones, and is developed in the soil. According to the opinion of some it results from the transformation of ice that is a thousand years old; but this is certainly not the case" (陳藏器曰。玻璃西國之寶也。玉石之類。生土中。或云千歲冰所化。亦未必然)。Nobody, as far as I know, has as yet explained the statement of Li Shi-chên that the original mode of writing is 頗黎, and that this name *P'o-li* is the designation of a country. *T'ai ping yü lan* (Ch. 808, p. 6) quotes a work *T'ien chu ki* 天竺記 ("Memoirs of India") as follows: "In the Himalaya, there is the mountain of precious stones producing the complete series of the seven gems (*saptaratna*), all of which may be obtained. Only the *p'o-li* gem is produced on such lofty peaks that it is difficult to obtain" (大雪山中有寶山諸七寶並生取可得。唯頗黎寶生高峯難得)。Here we are confronted with the reproduction of an Indian notion that meets its parallel in the *Ratnaparīkshū*, according to which rock-crystal is a product of Nepal (L. FINOT, *Lapidaires indiens*, p. 56). Certainly the people of India did not hunt for glass on the heights of the Himalaya. The King of Nepal adorned himself with pearls, *p'o-li*, mother-o'-pearl, coral, and amber (*T'ang shu*, Ch. 221 A, p. 1); his *p'o-li* certainly were a kind of rock-crystal, as also S. LÉVI (*Le Népal*, Vol. 1, p. 164) understands, but not glass. The Buddhist monk Hwei Yuan 慧苑 of the T'ang period, in his Glossary to the Buddhavataimsaka-sūtra (華嚴經音義, Ch. 1, p. 8, ed. of *Shou shan ko ts'ung shu*, Vol. 94; see Bunyiu Nanjio, No. 1600), explains *p'o-li* as "to some degree resembling in appearance rock-crystal (水精; that is, the variety of rock-crystal indigenous in China), yet occurring also in red and white varieties."

Chinese received were Indian manufactures. Hence it is legitimate to conclude that the Chinese name *huo-chu*, conferred upon these lenses, represents the translation of a corresponding Sanskrit term. Such, indeed, exists in the Sanskrit compound *agnimani*, the first element of which (*agni*) means "fire," answering to Chinese *huo*; and the second part of which (*mani*) signifies a "pearl, bead, gem, or jewel," exactly like the Chinese word *chu*.¹ Moreover, Sanskrit *agnimani*, according to the Sanskrit Dictionary of Boehtlingk, is an epithet of the stone *sūryakānta*, which means "beloved by the sun," so called because it produces fire under the influence of solar rays. Other synonymes are *tapanamani* ("sun jewel"), *tāpana* ("dedicated to the sun"), *dīptopala* ("refulgent stone"), *agnigarbha* ("essence of fire"), — all of these, as correctly seen by L. FINOT,² referring to rock-crystal. A Hindu treatise on precious stones, the *Navaratnaparikshā*, says, under the subject of rock-crystal, that the

¹ Although apparently formed in imitation of this Sanskrit expression, the term *huo chu*, notwithstanding, pre-existed in China independently of Indian influence, but in a widely different sense. The following story is on record in the Annals of the Tsin Dynasty (*Tsin shu*, Ch. 99, p. 1; biography of Hêng Hūan 桓玄). His mother, née Ma 馬氏, was sitting out one night with her companions in the moonlight, and saw a shooting-star fall into a copper basin filled with water. In the water appeared what looked like a fire-pearl (*huo chu* 火珠) of two inches, diffusing a bright, clear light. Madame Ma took it out with a gourd ladle and swallowed it. When she gave birth to her son, the house was filled with effulgent light; hence the infant received the name Ling-pao 靈寶 (that is, "Supernatural Treasure"). It is evident that this "fire-pearl" was a product of meteoric origin. A similar account is found in the Bamboo Annals: Siu-ki 修己, the mother of the Emperor Yü 禹, saw a falling-star, and in a dream her thoughts were moved till she became pregnant, after which she swallowed a spirit pearl (LEGGE, *Chinese Classics*, Vol. III, Prolegomena, p. 117). The term *huo chu* appears again in *Tsin shu* (Ch. 25, p. 13 b) in connection with the description of the costume, ornaments, and paraphernalia worn by the heir-apparent. There is no explanation of its meaning in this text: perhaps it was a flaming or sparkling gem. In the latter sense I encountered the term in two passages of the *Shi i ki* (Ch. 5, p. 5 b; and Ch. 7, p. 2; ed. of *Han Wei ts'ung shu*); in one case the question is of an extraneous hairpin adorned with a fire-pearl dragon and a phoenix.

² *Lupidaires indiens*, p. XLVII.

variety of the stone which, struck by sunlight, instantaneously elicits fire, is styled *sūryakānti* by the connoisseurs. The physician Narahari from Kashmir, who wrote a small *lapidarium* in the beginning of the fifteenth century, observes in regard to the same stone, "If it is smooth, pure, without fissures and flaws in the interior, if polished so that it displays the clearness of the sky, and if from contact with solar rays fire springs from it, it is praised as genuine."¹ Narahari dilates likewise on the medical virtues of the stone, to which he lends the attribute "sacred," and which, if honored, procures the favor of the sun.

Fire-production by means of lenses was not a very ancient, or a common, or a popular, practice in India, any more than in classical antiquity.² In the oldest epoch of India's history, the Vedic period, we hear only of fire-making by means of friction from wooden sticks. The daily birth of Agni, the god of fire, from the two fire-sticks (*araṇī*), is often alluded to in Vedic literature.

¹ R. GARBE, *Die indischen Mineralien*, p. 89. Garbo commits the error of regarding this stone as the sunstone, being misguided by the Sanskrit name *sūryakānta*, and speculates that also the Indian name has come with this stone to Europe. All this is erroneous. First, the sunstone is not known to occur in India, but it occurs near Verchue Udinsk in Siberia, Tvedestrand and Hitterö in Norway, Statesville in North Carolina, and Delaware County in Pennsylvania (BAUER, *Edelsteinkunde*, 2d ed., pp. 528, 529); second, the name "sunstone" is bestowed upon this kind of feldspar by us, not by the Indians, because it reflects a spangled yellow light originating from minute crystals of iron oxide, hematite, or gothite, included in the stone, and which both reflect the light and give it a reddish color (FARRINGTON, *Gems and Gem Materials*, p. 179); this case, therefore, is totally different from that which induced the Hindu to name a certain variety of rock-crystal "sun-beloved;" third, feldspars, like the sunstone, are not made into burning-lenses, such as are described by Narahari. After arriving at his fantastic result, Garbe is forced to admit that Narahari is wrong to classify the (that is, Garbe's) "sunstone" among the quartzes; but the physician of Kashmir who does not speak of "our" sunstone is perfectly right in grouping rock-crystal among quartzes, and the blunder is solely on the part of Garbe.

² The utility of the burning-lens, of course, has its limitations. It is dependent upon a cloudless sky and the power of strong sunlight. At night when fire may be most needed it is put out of commission.

They are his parents, the upper being the male, and the lower the female; or they are his mothers, for he is said to have two mothers.¹ The *Vāyu Purāna*, one of the oldest of the eighteen Purānas, presumably dating in the first half of the fourth century,² mentions three kinds of fire, — the solar fire (*saura*), or the pure one, or the fire of the gods; fire proceeding from lightning, procured from trees ignited by a lightning-stroke; and fire obtained by friction. Whether and how the first-named was secured we do not know. It would be very tempting to believe that this celestial fire, obtained by concentrating the rays of the sun, was the result of an application of lenses, as, indeed, is still the case in Siam (see below). Such a conclusion, however, would hardly be justified. In all probability, only the divine or transcendental fire, like that in the Greek myth of Prometheus, is here intended. Also in the Avesta, the sacred writings of the ancient Iranians, in which five kinds of fire are distinguished, the fire of heaven burning in the presence of Ahura Mazda is known;³ and there is no record of the use of burning-lenses on the part of the Iranians.⁴

¹ Compare A. A. MACDONELL, *Vedic Mythology*, p. 91; H. OLDENBERG, *Religion des Veda*, p. 105; R. ROTH, *Indisches Feuerzeug* (*Z. D. M. G.*, Vol. 43, pp. 590—595); F. SPIEGEL, *Arische Periode*, p. 147. The modern processes of fire-making in India are well described by E. THURSTON, *Ethnographic Notes in Southern India*, pp. 464—470 (Madras, 1906).

² V. A. SMITH, *Early History of India*, p. 305 (3d ed., Oxford, 1914).

³ A. V. W. JACKSON, in *Grundriss der iranischen Philologie*, Vol. II, p. 641; W. GEIGER, *Ostiranische Kultur*, p. 253.

⁴ A material difference between the fire-worship of the ancient Indians and Iranians lies in the point that fire-making ceremonies predominate with the former (a good and succinct description of these will be found in the new book of L. D. BARNETT, *Antiquities of India*, pp. 158—161), while the latter were eager to seek for the sites of natural fire (JACKSON, *Zoroaster*, pp. 98—101); so that the artificial production of fire was not part of their rites. Much valuable information relative to the Persian worship of fire has been gathered by ΔΙΕΥΛΑΡΟΥ (*Suse*, pp. 393 *et seq.*). The Avesta (*Vidēvdāt*, XIV, 7; F. WOLFF, *Avesta*, p. 405) mentions fire-implements without description of particulars, and we seem to have no information as to Iranian methods of fire-making. This is the more deplorable, as the Persian form of fire-worship spread into all parts of the world, — to

In Sanskrit medical literature I have not yet found any reference to burning-lenses,¹ but the employment of burning-mirrors in medical practice is well ascertained for ancient India. Such mirrors, probably made of metal,² are twice mentioned in the medical work *Ashlānga-Hridaya*.³ In one case, certain drugs are to be ground on it; and a counterpart of this practice appears in a recipe of the famous Bower Manuscript, coming down from the middle of the fifth century: "Let long pepper and turmeric be rubbed repeatedly on a mirror, and anoint with them the eye when it suffers severe pain; it will then quickly become well." In the other case (mentioned in the above work), the wound of a person bitten by a rat is to be cured by an arrow or a mirror, and, as

Rome (F. CUMONT, *Mysteries of Mithra*, p. 99; and *Oriental Religions in Roman Paganism*, p. 137), to India (R. G. BHANDARKAR, *Vaishnavism*, pp. 151—155), and to China (Masudi, in B. de MEYNAUD, *Prairies d'or*, Vol. I, p. 303; J. J. MODI, *References to China in the Ancient Books of the Parsees*, in his *Asiatic Papers*, pp. 241—254; CHAVANNES, *Le Nestorianisme*, *Journal asiatique*, 1897, pp. 60, 61, 74, 75; PELLIOU, *Bull. de l'École française*, Vol. III, pp. 669, 670). It could very well be conceived that the Persian Magi, who appear in India under the name Maga and in China as Mu-hu (*Mémoires concernant les Chinois*, Vol. XVI, p. 230; CHAVANNES and PELLIOU, *Traité Manichéen*, p. 170), should have had a certain share in the diffusion of burning-lenses; but this, for the time being, remains purely a matter of speculation, as we are entirely ignorant of any evidence in the case. One curious coincidence, however, deserves attention in this connection, and this is the sacred cauldron of the Siamese lighted with "celestial fire" by means of a burning-glass (mentioned below) and the same "celestial fire" kept constantly burning in a lamp by the Persian kings as a symbol of the perpetuity of their power; and it passed with the mystical ideas of which it was the expression to the Diadochi, and from them to Rome, where the celestial fire received as its emblem the inextinguishable fire that burned in the palace of the Caesars, and which was carried before them in official ceremonies.

¹ Cauterization was practised by Indian physicians (see HOERNLE'S translation of *Saṅgṛaha Saṅgṛahā*, pp. 74—80).

² Regarding mirrors in ancient India, see the writer's *Dokumente der indischen Kunst*, I, p. 174.

³ That is, the "Quintessence of the Eight Parts of Medicine," ascribed to the physician Vāgbhata, probably written before the eighth century (J. JOLLY, *Indische Medizin*, p. 8; the time of the work is fully discussed by JOLLY in *Z. D. M. G.*, Vol. 54, 1900, pp. 260—274).

supposed by Dr. Hoernle, by the reflection of the sun-rays focussed on it.¹

The lack of information on objects of reality so painfully obtrusive in Indian literature, combined with the defect of a sound chronological sense, renders it impossible to trace a *terminus a quo* for the utilization of burning-lenses; and the records of the Chinese present our only reliable source in this respect. Indeed, the students of India have never taken up this problem, and may now hear for the first time that burning-lenses were ever known in India. The information coming from Chinese sources, which establish the date of the first introduction of such lenses into China in the beginning of the seventh century, allows the inference that they were made and employed in India prior to this date. This result, however trifling it may appear at first sight, is significant in bearing out the fact that long before the Arabic invasion of India (710) burning-lenses were operated there, and that the idea cannot have been imported into India by the Arabs.

Sacred fire was annually obtained from crystal lenses at the Court of the Emperor Akbar, and all the fires of the imperial household were lighted from it. His historian, Abul Fazl Allami (1551—1602), thus describes the ceremony:² "At noon of the day, when the sun enters the nineteenth degree of Aries, the whole world being then surrounded by its light, they expose to the rays of the sun a round piece of a white and shining stone, called in Hindi *sūrajkrānt*. A piece of cotton is then held near it, which catches fire from the heat of the stone. This celestial fire is committed to the care of proper persons. The lamp-lighters, torch-bearers, and cooks of the household use it for their office; and when the year has passed in happiness, they renew the fire. The vessel

¹ Compare A. F. R. HOERNLE, *The Bower Manuscript*, p. 160.

² H. BLOCHMANN, *Ain I Akbari*, Vol. I, p. 48 (Calcutta, 1873).

in which this fire is preserved is called 'fire-pot.' There is also a shining white stone, called *chandrkrānt*, which, upon being exposed to the beams of the moon, drips water."¹

Burning-lenses are still employed in Siam at state ceremonies, like the New Year festival, or during the tonsure-ceremonial when Buddhist monks are ordained, for obtaining what is called the "celestial fire" (*fai fa*). The medium enlisted is a huge wax candle, styled *thien chai* (literally, "victorious taper"), which is prepared under the direction of the head priest of some royal temple. The wax employed for a single taper amounts to twenty-six pounds in weight; the wick consists of a hundred and eight cotton threads, a number sacred with the Buddhists; and the length is about five feet. Round it are inscribed the magical formulas and diagrams which are prescribed by custom. This sacred candle is usually lighted by means of celestial fire, generated from the sun by the use of a huge burning-glass (*wen fai*) mounted on a richly gilded and enamelled frame. The fire thus kindled is protected in a lamp until the auspicious moment arrives for applying it to the "torch of victory." The lamp is then brought before the king, who takes

¹ The Hindi word corresponds to Sanskrit *candrakānta* ("beloved by the moon"), in the same manner as does *sūryakānta* to the above Hindi name for the crystal lens. *Candrakānta* is a kind of rock-crystal, generally believed in India to shed water when the moon shines on it (FISCHER, *Lapidaires indiens*, p. XLVII). The Tibetan rendering of this term is *c'u žel* ("water crystal"), explained as "a fabulous magic stone supposed to have the power of producing water or even rain" (JASCHKE, *Tibetan-English Dictionary*, p. 562). GRENARD's opinion (*Mission scientifique dans la Haute Asie*, Vol. II, p. 407), that this stone "employed by the Tibetan sorcerers who have the power of causing or stopping rain" probably is jade, is inadmissible; the Tibetan word for "jade" is *yang-ti* or *g-yang-ti* (*Polyglot Dictionary of K'ien-lung*, Ch. 22, p. 64), the history of which I hope to trace some day in another place. — Tibetan has also a term for a burning-lens, — *me žel* ("fire crystal") or *sreg byed žel* ("burning crystal"); likewise Lepcha *mi jer* or *Jer mi* (MAINWARING-GRÜNWEDEL, *Dictionary of the Lepcha Language*, pp. 285, 434). According to H. VON SCHLAGINTWEIT (*Reisen in Indien und Hochsien*, Vol. II, pp. 201, 202) burning-glasses imported from China are widely used in Tibet for fire-making; he himself witnessed in Sikkim the employment of such glasses directed on tinder.

a taper, termed the "ignition candle," which he lights at the celestial fire, while reciting a prayer-formula. The king then hands the ignition candle to the head priest, who applies its flame to the *thien chai*. During this performance the attendant chapter of monks rehearses a prayer. The torch is kept lighted in a special white gauze frame. A solemn ceremony takes place also at the time when it is extinguished.¹

ICE-LENSES. — Everybody knows that also a flake of ice, if cut into the form of a convex lens, may serve as a burning-glass with good effect. The Chinese have had this experience; and one of their books, the *Po wu chi* 博物志, a collection of notes on remarkable objects and occurrences, has it on record that "fire may be obtained by cutting a piece of ice into circular shape, holding it in the direction of the sun, and placing mugwort (*Artemisia*) behind the ice, so that it falls within the shadow."² It should be added that this notice figures under the title " juggler's art" 戲術; and it is from this class of performers, who swallow fire and swords, that the demonstration of such an experiment might be expected. Nevertheless, Li Shi-chên found it advisable to insert this notice in his essay on the mugwort,³ as if it had ever been a common practice of physicians to apply the moxa to their patients by means of an ice-lens. This, however, remains open to doubt. Mugwort is said to have received the name "ice-terrace" (*ping-t'ai*) from the employment of ice-lenses. The authorship of the work above quoted is attributed to Chang Hua 張華, who lived from 232 to 300. If Chang Hua of the third century should really have written this

¹ After G. E. GERINI, *The Tonsure Ceremony as performed in Siam*, p. 161 (Bangkok, 1893). — Regarding crystal lenses in Japan see GEERTS, *Produits de la nature japonaise et chinoise*, p. 243.

² 削冰令圓舉以向日以艾於後承其影則得火 (Ch. 4, p. 4b; edition printed in Wu-ch'ang).

³ *Pên ts'ao kang mu*, Ch. 15, p. 3.

passage, the case would indeed be notable in establishing the fact that four centuries prior to the first introduction of burning-lenses from Indian regions the latter were known in China as an apparently native idea. Indeed, this text has been accepted in this sense, and was marched forward by G. SCHLEGEL¹ as a strong bulwark in his argumentation for the indigenous origin of burning-lenses in China; but this plea will melt away as easily as the bit of ice when its function as lens was over. Also Schlegel had access to WYLIE's *Notes on Chinese Literature*, from which we learn (p. 192) that the work *Po wu chi*, originally drawn up by Chang Hua, was lost in the Sung period (960—1278); that the present book with that title was probably compiled at a later period on the basis of extracts contained in other publications; and that there are many quotations from it in the ancient literature which do not appear in the modern edition. There is, accordingly, no guaranty whatever that any text in this work, as it is now extant, goes back to the third century and originates from the hand of Chang Hua. The text in question is quoted by Li Shi-chên from the *Pi ya* 埤雅, a dictionary compiled by Lu Tien 陸佃 (1042—1102), so that from this indication we may carry it to the latter part of the eleventh century. It is certainly far older than that; but it cannot have been penned by Chang Hua, and, at the very best, cannot date back farther than the first half of the seventh century, when burning-lenses first became known in China. The *Annals of the T'ang Dynasty*, as we noticed, record burning-lenses in the possession of the Lo-ch'a as an entirely novel affair, describing their use and effect, and this incontrovertibly proves that they were unknown in times previous. Neither do the T'ang

¹ *Uranographie chinoise*, p. 142; *Nederlandsch-Chineesch Woordenboek*, Vol. I, p. 674; and *T'oung Pao*, Vol. IX, 1898, p. 179. The allegation of Schlegel that lenses of ice were used before the invention of glass is pure invention, being contained neither in this nor in any other Chinese text.

authors assert that they were known at an earlier date (Yeu Shiku, on the contrary, insists on their being imported "at present;" that is, in his own lifetime), nor is there any record in the historical annals relating to the third century to the effect that such lenses should have been in vogue at that period. Whoever reads with critical eyes the account now sailing under the false flag of the *Po wu chi* will soon notice that in its style it is worded on the basis of the text of the T'ang Annals, and also that it materially depends upon the latter, — materially, because it was only after, and in consequence of, the introduction of foreign crystal lenses, that the experiment with ice could have been conducted in China. This idea was not conceived by the Chinese as the result of a natural observation or optical study, which they never cultivated; but ice was resorted to as a makeshift, as a substitute for the costly rock-crystal, on the theory of their nature philosophy, that the latter is transformed ice: crystal and ice, being products of a like origin, were thought to be able to bring about the same effect.

CONCLUSIONS. — When we now attempt to reconstruct the general history of burning-lenses, the principal fact standing out is that China, despite the opposite contention of some enthusiasts, has not the shadow of a claim to their invention, but, on the contrary, admits her debt to Lo-ch'a and Champa; that means, to India. China received them from India in the same manner as mediæval Europe and the Arabs received them from Greece and Rome. The problem, therefore, crystallizes around the central point: In what reciprocal relation or obligation are India and Hellas? Hellas, at the outset, is entitled to the privilege of chronological priority, and

can point to the well-fixed date 423 B.C., when Aristophanes wrote his *Clouds*. At that time, we may assert positively, burning-lenses were unknown in India, for which we have merely a retrospective *terminus a quo* lying backward of the seventh century A.D. Negative evidence in this particular case is somewhat conclusive: for, with all their ideas of the sacredness of fire and its prominent position in religious worship, the ancient Hindu themselves would not have allowed such an excellent contrivance to escape, — a contrivance that would have brought the realization of their dreams of celestial fire. The fact remains that none of the Sanskrit rituals ever mention such an implement, which, for this reason, cannot have been of any significance in the culture-life of the nation. It is therefore highly improbable, nay, impossible, that the Hindu should have independently conceived the invention. Even if our conclusion, based on Chinese documents, that burning-lenses were employed in India prior to the seventh century, should be substantiated in the future by the efforts of Indian research, and, for example, be carried back to a few centuries earlier, this would hardly change our result fundamentally, or overthrow the impression that the use of such lenses belongs to the mediæval epoch of Indian history. There are good reasons for upholding this opinion and for connecting their introduction with the influence upon India of Hellenistic-Roman civilization. First, we may say negatively that it was not Assyria which transmitted the idea to India. In that case, we should justly expect that it would turn up there at a much earlier date, and occur simultaneously in ancient Persia; but Zoroastrian Persia, like Vedic India, lacks them entirely. This observation justifies us in concluding also that burning-lenses played a

very insignificant part, if any, in Mesopotamia; if they did, we should find them also in Greece at a much earlier date. Without pressing the question of the when and where of the original invention, we must be content at present to regard the Greeks as the people who, we know positively, made the first use of optical lenses. The second negative evidence that is impressed upon us is this, that Alexander's campaign cannot be made responsible for the transmission. It is needless to insist that the historians of Alexander are silent about it; coeval India is likewise so; and it is inconceivable that an idea, though Alexander's genius should have carried it into the borders of India, would have borne fruit on her soil only as late as the middle ages. The Arabs, as already observed, did not transfer it, either, to India. If we strictly adhere to our chronological result, we are clearly carried into the Gupta period, which, taken in a wide sense, extends from about 300 to 650 A.D., and which, particularly in the fourth and fifth centuries, was a time of exceptional intellectual activity in many fields,¹ in mathematics, astronomy, and medicine, all of which have received an appreciable stamp of Western influence.² Indeed, as emphasized by Smith, the eminent achievements of this period are mainly due to contact with foreign civilizations, both on the East and on the West, and the fact of India's intercourse with the Roman Empire is indisputable. The conquest of Mālwa and Surāshtra by Caudragupta II Vikramāditya toward the close of the fourth century opened up ways of communication between Upper India and Western lands which

¹ V. A. SMITH, *Early History of India*, 3d ed., p. 304.

² See particularly A. WEBER, *Die Griechen in Indien* (*Sitzungsberichte Berliner Akademie*, 1890, pp. 921—925); G. D'ALVIELLA, *Ce que l'Inde doit à la Grèce*, pp. 95—119 (Paris, 1897); G. THIBAUT, *Indische Astronomie*, pp. 43, 76.

gave facilities for the reception of European ideas. It is accordingly a reasonable conclusion that burning-lenses were transmitted to India, not from Hellas, but from the Hellenistic Orient of the Roman Empire, in a period ranging between the fourth and sixth centuries, to be passed on to China in the beginning of the seventh century. The introduction of the burning-mirrors alluded to in the Bower Manuscript, in my opinion, falls within the same epoch, emanating from the same direction.

ADDITIONAL NOTES. — P. 202, note 2. The tree in question is the *pārijāta* (see *Fan yi ming i tsi*, Ch. 25, p. 27 b, ed. of Nanking).

P. 206, note. Compare also *lang-tang* 琅璫 and 銀鐺; an interesting notice on this word is contained in the *Ning kai chai man lu*, Ch. 7, p. 27 b (*Shou shan ko ts'ung shu*, Vol. 71).

The interesting study of Dr. M. W. de Visser (*Fire and Ignis Fatui in China and Japan*, reprint from *M.S.O.S.*, 1914, pp. 97—193) reached me only a short while ago when my manuscript was in the press. Dr. de Visser touches some questions dealt with on the preceding pages, though from a different point of view, but he accepts Schlegel's statements and the text of the *Po wu chi* without criticism.

MÉLANGES.

BURNING-LENSES IN INDIA. ¹

A burning-lens is mentioned, and its utilization is demonstrated, in the story of King Virūdhaka, contained in the Tibetan biographies of Buddha. This story was first disclosed by A. SCHIEFNER ² from the Tibetan *Life of Buddha*, compiled in 1734 by Rin-č'en č'os-kyi rgyal-po. When the cruel king Virūdhaka had vanquished and slaughtered the Śakyas, Bhagavat betook himself to Ćrāvastī, where he dwelt in the Jetavana, and predicted that Virūdhaka in the course of seven days would be consumed by fire and be reborn in Hell. The king built a palace of several stories in the water and lived there; on the seventh day, however, the sun struck a burning-lens which belonged to the royal consort, whereupon the king and Ambarīsha were seized by the flames, with loud cries for help [perished, and] were reborn in the hell Avīci. ³ This story is embodied in the Vinaya, as translated in the Tibetan Kanjur (vol. X), where it is narrated at greater length and with more details. In the rendering of L. FEER, ⁴ the relevant passage runs thus: "Sur ces entrefaites, le temps s'éclaircit, les rayons du soleil donnèrent sur le verre ardent; il se produisit un feu qui gagna le coussin; du coussin, il se communiqua au pavillon." Finally we read in ROCKHILL'S *Life of the Buddha*, translated from the Kanjur, as follows (p. 122): "When Virūdhaka's messenger came and told him what the Buddha had said, he was filled with trouble. Ambharīsha comforted him with the assurance that Gautama had only said this because the king had killed so many of his people. Moreover, he advised him to have a kiosk built in the water, and there to pass the seven days. The king followed his

¹ Compare this volume, pp. 216—223.

² *Tibetische Lebensbeschreibung Śakjamuni's*, p. 59 (St. Petersburg, 1849).

³ The Tibetan text (fol. 337 b) runs as follows: de-nas bčom ldan ʔdas mfan-yod-du gšegs-nas rgyal-byed ts'al-na bžugs-te | ʔp'aga-skyes-po žag bdun-na mes ts'ig-sta dmyal-bar skye-bar luñ btan-pas | des č'ui nañ-du k'añ bzans brtsigs-te adug-pa dañ | žag bdun-pai ts'e na bteun-moi me šel la ši-ma p'og-pas rgyal-po dañ ma-la gnod mes ts'ig-nas o-dod ʔbod bžin-par mnar-med-du skyes-so.

⁴ *Fragments extraits du Kandjour (Annales du Musée Guimet, Vol. V, 1883, p. 76).*

advice, and retired to the kiosque with all his harem. On the seventh day, as they were preparing to return to Çrāvastī, and the women were arraying themselves in all their jewels, the sky, which until then had been overcast, cleared up, and the sun's rays falling on a burning-glass which was on a cushion, set fire to the cushion, and from that the flames spread to the whole house. The women ran away and made their escape, but when the king and Ambharisha tried to do likewise, they found the doors shut, and with loud cries they went down into the bottomless hell."

It appears from these texts that the burning-lens was mentioned in the Sanskrit original from which the Tibetan translation was made. The lens is styled *me śel* (literally, "fire crystal"), which was indicated by the writer as the Tibetan term (this volume, p. 222). The fact that in this case a burning-lens is really understood may be proved beyond doubt from another Tibeto-Sanskrit text. The story of Virūḍhaka is recorded in the Avadānakalpalatū (No. 11), and here we meet likewise the lens, called in Sanskrit *sūryakānta* (this volume, p. 217), in the Tibetan version *me śel*.¹ In the Tibetan prose edition of the same work (p. 48) it is said that the lens belonged to the ornaments of the house, that it was hit by the sunlight, that thus fire broke out in the building, and everything was burnt up (k'añ-pai rgyan la me śel yod-pa-la ñi-mai mdañs p'og-pas rkyen byas | k'iyim-la me śor-nus kun ts'ig-go). The versified recension is briefer and simply says that through the concentration of the solar rays in the lens the conflagration was effected (me śel ñi-mai od-dag-gi sbyor-bas me ni rab-tu ṅbar). The Avadānakalpalatā was compiled by the Kashmirian poet Kshemendra, who lived around 1040 A.D., from older collections of Avadānas, and was translated into Tibetan in 1273.

Hüan Tsang, while visiting the kingdom of Çrāvastī, was shown the dried-up lake in which Virūḍhaka was said to have perished. In the pilgrim's narrative no allusion is made to a lens, but according to him the waves of the lake suddenly divided, flames burst forth, and swallowed the boat in which the king was.²

The Sanskrit term *sūryakānta* is rendered into *me śel* also in the Tibetan translation of the Lalitavistara (chap. 15; ed. of FOUCAUX, Vol. I, p. 157, line 15; Vol. II, p. 196), but a precious rock-crystal, not a burning-lens, is here in question. Compare SCHIEFNER's remarks on this passage in *Mélanges asiatiques*, Vol. I, p. 234.

D. LAUFER.

¹ See the edition of Chandra Das in *Bibliotheca Indica*, Vol. I, pp. 392, 393.

² Compare JULIEN, *Mémoires*, Vol. I, p. 307; S. BEAL, *Buddhist Records*, Vol. II, p. 12.

VIDAṄGA AND CUBEBS.

In their monumental work *Chau Ju-kua* (p. 224), HIRTH and ROCKHILL have acquainted us with the vegetal product derived from a creeper growing in Su-ki-tan on Java, and styled by Chao Ju-kua *pi-têng-k'ie* 畢澄茄. The translators of this author annotate that, according to the *Pên ts'ao kang mu*, this is a foreign word which occurs also in the transcription *p'i-ling-k'ie* 毗陵茄. This name itself, however, is not explained by them. It is, first of all, important to note from which time these transcriptions come down. The earliest author cited in the *Pên ts'ao* as speaking of *pi-têng-k'ie* is Ch'ên Ts'ang-k'ie 陳藏器, who lived during the first part of the eighth century, and who localizes the habitat of the plant on Sumatra (*Fu shi* 佛誓, Bhōja). Hence we are entitled to the inference that we face a transcription made in the style of the T'ang period; and, to all appearances, we are confronted with the reproduction of a Sanskrit word. The three elements of which the term is composed are well known from the nomenclature of the Chinese Buddhists: Chinese *pi* or *p'i* renders Sanskrit *vi* or *bi*; the alternation of *têng* and *ling* allows us to presuppose an initial cerebral in Sanskrit with the choice of a cerebral *!* in Prākṛit; the phonetic element *têng* 登 corresponds to ancient **tañ* and **dañ* (for instance, in *Mātaṅga* and *daṁshṭra*), while *ling* renders *lin*, *leñ*, or *lañ*; *k'ie* 茄 ("brinjal") has only the ancient phonetic value of *ga*, being the equivalent of 伽, the classifier 十 (in the same manner as in the first character *pi*) being chosen merely in view of the botanical significance of the whole term. Thus we obtain a Sanskrit form *viḍaṅga*, and I had indeed arrived at this restoration from a purely phonetic point of view, without knowing that such a Sanskrit word exists, or what it means. The transcription *pi-ling-k'ie* would justify the assumption of a Prākṛit form *viḷaṅga* or *viḷeṅga*, and in Bengālī we have *birāṅga* (in *Hindu-stānī baberañ*, *wawruñ*; in *Puṣtu bábrañ*). An Arabic form *fileṅga* (see p. 285) likewise supports this view.

The word *viḍaṅga* is of ancient date: it occurs in the *Suḥṛuta-saṁhitā* and repeatedly in the *Bower Manuscript* (also in the form *bidāṅga*).¹ This plant has been identified with *Embelia ribes* (family *Myrsineae*), an immense climber abundant in the hilly parts of India from the Central Himalaya to Ceylon and Singapore, and occurring also in Burma. Its seeds are extensively

HOERNLE, *The Bower Manuscript*, pp. 301, 320.

employed as an adulterant for black pepper.¹ W. ROXBURGH² states more specifically, "The natives of the hills in the vicinity of Silliet, where the plants grow abundantly, gather the little drupes, and when dry sell them to the small traders in black-pepper, who fraudulently mix them with that spice, which they so resemble as to render it almost impossible to distinguish them by sight, and they are somewhat spicy withal." The seeds of another species (*Embelia robusta*) are eaten by the Paharias of the Darjeeling district.³ This description answers well the pepper-like black seeds dried in the sun, as described by Chao Ju-kua. HIRTH and ROCKHILL, however, are perfectly correct in identifying Chao Ju-kua's vidāṅga growing on Java with *Piper cubeba* (family *Piperaceae*).⁴ It was evidently from Sumatra and Java that the term vidāṅga was introduced into China together with the cubebs. The Sanskrit term must have been transferred to this plant autochthonous to Java, because the products of the Indian and Javanese climbers were very similar in appearance and in their properties. The word doubtless belonged to the Kawi language. Other such instances are known where the Hindu settlers on Java named indigenous products of the island with Sanskrit words designating other species. An example of this kind is afforded by the *pin-kia* 頻伽 birds sent as tribute from Kalinga (訶陵, Java) to the Chinese Court in the year 813.⁵ The name *pin-kia* apparently is an abbreviation of Sanskrit kalaviṅka, written in Chinese 迦陵 (or 羅) 頻伽,⁶ exactly corresponding with

¹ WATT, *Dictionary of the Economic Products of India*, Vol. III, p. 242. *Embelia ribes* Burm. is stated to occur also in southern China, Habang and the Lo-fon shan in Kuang-tung Province and Hongkong being given as localities (FORBES and HEMSLEY, *Journal of the Linnean Society, Botany*, Vol. XXVI, pp. 52, 63). According to the same authors, four other species of *Embelia* occur in southern China. It seems, however, that none of them is known by a Chinese name or is mentioned in the *Péa ts'ao* literature. *Embelia ribes* Burm. is found also in the Dutch East Indies (*Encyclopædie van Nederlandsch-Indië*, Vol. II, p. 218: "De vruchtjes en een uit deze bereid werkzaam beginsel [embelia-zuur] zijn in den laatsten tijd in Europa als voortreffelijk lintworm-middel in gebruik genomen"). As regards Burma, it is frequent in the tropical forests of Mrtaban and Upper Tenasserim (S. KUEZ, *Forest Flora of British Burma*, Vol. II, p. 102).

² *Flora Indica*, p. 197 (Calcutta, 1874).

³ J. S. GAMBLE, *List of the Trees, Shrubs, and Large Climbers found in the Darjeeling District*, p. 53 (Calcutta, 1896).

⁴ This identification is due to D. HANBURY (*Science Papers*, p. 246). It is given after the latter by S. W. WILLIAMS (*Chinese Commercial Guide*, p. 117), F. P. SMITH (*Contributions toward the Materia Medica of China*, pp. 79, 83), and G. A. STUART (*Chinese Materia Medica*, p. 144, Shanghai, 1911).

⁵ *Tang shu*, Ch. 222 B, p. 3.

⁶ *Fan yi ming i tsi*, p. 20^b (edition of Nanking). Compare EITEL, *Handbook of Chinese Buddhism*, p. 67.

the Tibetan rendering *ka-la-piñ-ka*, the Indian cuckoo extolled for its melodious voice.¹

In regard to the adjustment which has taken place in the Archipelago between the designations for *Embelia ribes* and *Piper cubeba*, we meet a very interesting parallel in the materia medica of the Arabs. These have been acquainted since the early middle ages with the product of the latter species, known to them under the name *kabāba* كبابنة, whence our word "cubeb" is derived,² and discussed at length by Ibn al-Baitār (1197—1248).³ One of the

¹ It is not known to me whether the word piñka or viñka is recorded in the Kawi language of Java, but, judging from the Chinese notation of it in the T'ang Annals, I feel certain that it must have existed there with reference to a fine song-bird indigenous to Java. GROENEVELDT (*Notes on the Malay Archipelago*, in *Misc. Papers rel. to Indo-China*, Vol. I, p. 140) observed that "about these birds many an hypothesis is possible, but not one seems satisfactory." It is matter of regret that he has withheld from us his opinion on the subject. E. STRESEMANN, in a most interesting study on the historical development of our knowledge of birds of paradise (*Novitates Zoologicae*, Vol. XXI, London, 1914, pp. 13—24), has recently offered the suggestion that the Javanese *pin-kia* birds of the T'ang History possibly might have been birds of paradise. This supposition, however, is improbable. Birds of paradise do not sing at all, but are sought for only on account of their magnificent plumage. Moreover, birds of paradise do not live on Java. The centre of their habitat is New Guinea, where twenty-seven known species breed; while three inhabit the northern and eastern parts of Australia, and one the Moluccas (WALLACE, *The Malay Archipelago*, pp. 419—440). Accordingly, the earliest opportunity of the Javanese to become acquainted with birds of paradise was granted at the time when the people of Java reached the Moluccas; and this was not the case before the middle of the fourteenth century, when King Mājapāhit extended his power into those regions, as narrated in the Old-Javanese poem *Nāgarakrētāgama* of the year 1365 (translated by H. KERN, *De Indische Gids*, Vol. XXV, 1903, pp. 341—360). As admitted by STRESEMANN in another article (*Novitates Zoologicae*, Vol. XXI, 1914, p. 39), it was at that time that the cassowary of Ceram was first introduced into Java (and it is Stresemann's particular merit that he rejected the old error that the original home of the cassowary, known to the Chinese as *huo chi* 火鷄 [see GROENEVELDT, *l. c.*, pp. 192, 193, 198, 253, 262] was on Sumatra, Java, or Banda); but the same admission must hold good for birds of paradise. Regarding the possibility of the importation of the dried skins for these birds into China, compare F. W. K. MÜLLER in *T'oung Pao*, Vol. IV, 1893, pp. 82—83 (an article not consulted by Stresemann, nor did he utilize YULE's important contribution to the subject in his *Hobson-Jobson*, p. 95), with comments by HIRTH (*T'oung Pao*, Vol. V, 1894, pp. 390—391) and GROENEVELDT (*ibid.*, Vol. VII, 1896, p. 114). This subject would be deserving of a renewed and more profound investigation: the objections raised by Hirth and Groeneveldt to Müller's thesis are by no means convincing to me, and at all events will not terminate the discussion.

² YULE and BURNELL, *Hobson-Jobson*, p. 277. The introduction of cubeb into our pharmacopœia is due to the Arabic physicians of the middle ages.

³ L. LECLERCQ, *Traité des simples*, Vol. III, p. 138.

earliest authors cited by him, Ibn al-Heitsem, discriminates between two varieties, a larger and a smaller one, the larger one being *habb al-a'rus* حبّ العروس, the smaller one *falinġa* or *falenġa* فلنجة. The latter kind is treated by Ibn al-Baitār, who has arranged his material in alphabetical order, under a separate entry,¹ where LECLERC, the excellent translator of the Arabic work, annotates, "Nous ignorons quelle est cette graine. Ce n'est pas le cubèbe ni la muscade. C'est la graine d'une plante qui croît dans l'Inde et atteint la hauteur d'environ une coudée," etc. Both the description given in the text and the very name *falenġa* leave no room for doubt that the vegetal product in question is the vidāṅga of India. Arabic *falenġa* is merely a reproduction of this word, and the older Arabic articulation doubtless was *filenga* or *silanga*, which is in perfect harmony with the Chinese transcription *pi-liñ (leñ)-ga*.²

Hirth and Rockhill err in restricting the occurrence of *Piper cubeba* to Java only.³ According to WATT,⁴ the plant is a native of Java and the Moluccas, and is cultivated to a small extent in India (most probably due to importation from the Archipelago). The well-informed *Encyclopædie van Nederlandsch-Indië*⁵ states that the creeper occurs wild in Java and Borneo, and is cultivated throughout the Dutch East Indies, being exported in large quantities to Holland, where it receives its function in the pharmacopœia.⁶ Ch'en Ts'ang-k'fi, as stated, refers the plant to Sumatra; and whether it grows there or not, its ready-made product seems to have first reached the Chinese from Sumatra rather than from Java.⁷ It is interesting to note that at the same time cubebes had entered India; for Ibn-Khordābeh, who wrote between

¹ LECLERC, *l. c.*, Vol. III, p. 40, No. 1695.

² In view of the Arabic importation of both cubebes and vidāṅga from India and of cubebes also from the Archipelago and China (see below), these two products ought to have been included by G. FERRAND (*Relations de voyages et textes géographiques arabes, persans et turks relatifs à l'Extrême-Orient*, Vol. I, p. 234) in his list of Indian and East-Asiatic products assembled from the great work of Ibn al-Baitār. It is gratifying, at any rate, that Ferrand calls the special attention of "indianistes, sinologues et indo-sinologues" to the translation of Leclerc, which "is not as well known as it ought to be." The writer has ploughed through Leclerc's work for the last fifteen years, and has always found it a most trustworthy, helpful, and inspiring companion.

³ They do not refer to Marco Polo, who mentions cubebes among the products of Java (ed. of YULE and CORBIEN, Vol. II, p. 272).

⁴ *L. c.*, Vol. VI, pt. 1, p. 257.

⁵ Vol. II, p. 255.

⁶ The Dutch name *staartpeper* ("tail-pepper") presents a literal translation of Malay *lāda barekor*, or *mariča buntut*.

⁷ According to the *Encycl. Brit.* (Vol. VII, p. 607), *Piper cubeba* is indigenous to South Borneo, Sumatra, Prince of Wales Island, and Java.

844 and 848, enumerates them among the export-articles of India.¹ Li Sün 李珣, the author of the *Hai yao pên ts'ao* 海藥本草 in the second half of the eighth century, quotes a work *Kuang chou ki* 廣州記 ("Records of Kuang-tung") as saying that cubebs grow in all maritime countries and are identical with tender black pepper.² Li Shi-chên comments that they are found in Hai-nan and all foreign countries (scil., of the south?).³ Of greater importance is the fact that under the Sung dynasty the plant was cultivated in the soil of Kuang-tung Province, as reported by Su Sung 蘇頌 in his *T'u king pên ts'ao* 圖經本草.⁴ In Persian, in Hindustāni, Bengāli, and other Indian languages, cubebs are still called *kabāb-īnī* کباب چینی; that is, *kabāb* from China.⁵

GARCIA DA ORTA⁶ supplies us with some information on this point, which is interesting enough to be cited in extenso: "Tametsi cubebis raro in Europa utamur, nisi in compositionibus: attamen apud Indos magnus earum in vino maceratarum est usus ad excitandam venerem; tum etiam in Iaoa [Java] ad excalfaciendum ventriculum.⁷ Appellatur hic fructus ab Arabibus medicis Cubebe et Quabeb; a vulgo Quabebechini: in Iaoa, ubi frequens nascitur, Cumuc;⁸

¹ G. FERRAND, *l. c.*, Vol. I, p. 31.

² 澄茄生諸海國乃嫩胡椒也 (according to another reading, "the tenderest of black pepper" 胡椒之嫩者).

³ 海南諸番皆有之. — Ibn Rosteh, who wrote about 903, mentions cubebs as products of the island Salāhat in the Archipelago; Masūdī, as products of the kingdom of the Mahārāja (G. FERRAND, *l. c.*, Vol. I, pp. 79, 90, 110).

⁴ Finally the word *pi-téng* 畢澄 was transferred to a kind of wild pepper 山胡椒 growing in Kuang-si, as stated in the *Chi wu ming shi t'u k'ao* 植物名實圖考 (Ch. 25, p. 69) of 1838 (see BRETSCHNEIDER, *Bot. Sin.*, pt. 1, p. 72). This work contains also an illustration of the plant; so does the *Chéng lei pên ts'ao* (Ch. 9, fol. 44), where it is entitled "*pi-téng-k'ie* of Kuang-chou."

⁵ See YULE in his edition of *Marco Polo*, Vol. II, p. 391.

⁶ Latinized ab Horto. Garcia went to India in 1534 as physician of the Portuguese Viceroy, and during thirty years made a most thorough study of Indian drugs, products, and medicine. The results of his labor were published at Goa, 1563, under the title "Coloquios dos simples, e drogas e cousas medicinais, e assi dalguas frutas achadas nella India Oriental onde se tratam algumas cousas tocantes a medicina, pratica, e outras cousas boas para saber." Only six copies of this original edition are said to be in existence. I quote from the Latin edition of C. CLUSTUS (p. 111), published at Antwerp in 1667.

⁷ For the warming of the stomach. ACOSTA, who wrote a treatise on the drugs of India in 1578, as quoted by Yule, says that the Indian physicians use cubebs as cordials for the stomach.

⁸ Javanese *kumukus*; Malayan *temukus*.

a reliquis Indis, praeterquam in Malayo, Cubabchini. Non est autem sortitus hanc appellationem, quod in China nascatur, quandoquidem ex Cunda¹ et Iaoa, ubi plurimus est, in Chinam perferatur: sed quoniam Chineses, qui Oceanum Indicum navigabant, hunc fructum, quem in iam onumeratis insulis emerant, cum aliis mercibus in alios maris Indici portus et emporia deferebant." Garcia, accordingly, regarded the Chinese only as the importers of the product, not as its growers; and it may be admitted that the bulk of the Chinese importation into India traced its origin to the Archipelago. Garcia, however, never visited China; and we have no reason to question the accuracy of the Chinese account claiming indigenous cultivation, which is amply confirmed by modern observers. In 1789 LOUREIRO, in his *Flora Cochinchinensis*, pointed it out as being cultivated in Indo-China.² F. P. SMITH refers to the probable introduction of the species from Sumatra or Java into the province of Kuang-tung. FORNES and HEMSLEY,³ in their comprehensive work on the systematic botany of the East, state in regard to the species (named by them *Litsea cubeba*), "We have only seen the fruit as it appears in commerce, and it is similar to that of the 'mountain pepper' of Central China (*Litsea pungens*, Hemsl.), yet evidently not the same, nor even a cultivated variety of it."

In the Tibetan-Chinese List of Drugs *Fan Han yao ming* 番漢藥名⁴ we meet the Sanskrit *viḍaṅga* under No. 117 in the Tibetan transcription *byi-taṅka* or *byi-taṅga*,⁵ explained through Chinese *man-king-tse* 曼荆子 (*Vitex trifolia*),⁶ a plant growing abundantly in northern China, and furnishing a black berry which is used in medicine. Hence the adjustment with *viḍaṅga* was effected: indeed, Ch'ên Ts'ang-ki remarks that the *pi-t'ung-k'ie* (*viḍaṅga*), in their appearance, resemble the seeds of the *wu-t'ung* 梧桐 (*Stereulia platanifolia*) and those of the *man-king*. On the other hand, we encounter in the same List of Drugs (No. 192) the Chinese term *pi-t'ung-k'ie*

¹ Identical with Cunda, Sunda (see YULE and BURNELL, *Hobson-Jobson*, p. 968).

² BRETSCHNEIDER, *Early European Researches into the Flora of China*, p. 171

³ *Journal of the Linnean Society* (sect. Botany), Vol. XXVI, p. 380.

⁴ See for the present BRETSCHNEIDER, *Bot. Sin.*, pt. 1, p. 104. I hope to give shortly a bibliographical study of this work, which would be too long to insert here. My quotations from it refer to a critical edition (in manuscript) prepared by me. The substance of the work is embodied in A. POZDNYAYEV'S УЧЕБНИКЪ ТИБЕТСКОЙ МЕДИЦИНЫ (Vol. I, pp. 247—301). A very poor and careless edition of it was published in 1913 by HÜBOTTER (*Beiträge zur Kenntnis der chin. sowie der tib-mong. Pharmakologie*).

⁵ Likewise in Mongol *byidaṅga* (the addition of the letter *y*, as in Tibetan, denoting palatalized *l'*). The word *viḍaṅga* is not contained in the *Mahāvyaṅgī*, and it is not known to me how old the Tibetan transcription is.

⁶ BRETSCHNEIDER, *Bot. Sin.*, pt. 2, p. 357; STUART, *Chinese Materia Medica*, p. 457.

碧澄¹ 茄, with a Tibetan equivalent *rin-po-ŕe myag*. The first element of this compound means "precious, valuable;" the word *myag*, not recorded in our Tibetan dictionaries, still awaits explanation. It was not known heretofore that the seeds of *Piper cubeba* or *Embelia ribes* were employed in Lamaist pharmacology, but to all appearances this seems to have been (or still to be) the case.

The previous notes bear out the fact that it is not always sufficient to define pharmacological terms of East-Asiatic languages merely by way of determination of the specimens to which the technical terms at present relate, but that philological and historical researches are indispensable in order to reach a full understanding of the real facts. New associations of ideas were formed when new products turned up and crossed the experience of an earlier allied substance; new adaptations of terms were brought about, rallying most diverse species under the same flag.

B. LAUFER.

¹ If S. W. Williams and his successors transcribed this character *ching* and *ch'êng*, they were, as far as the modern language is concerned, quite correct; for the Tibetan-Chinese work, in which the Chinese names are transcribed in Tibetan letters for the benefit of the Tibetans trading with Chinese in drugs, renders the character in question by *c'ên*.

ASBESTOS AND SALAMANDER,

AN ESSAY IN CHINESE AND HELLENISTIC FOLK-LORE.

BY

BERTHOLD LAUFER.



It is my object, not to write a history of asbestos and its application with reference to human culture, but to unravel the curious traditions entertained by the Chinese regarding this marvellous production of nature, and to correlate their notions of it with the corresponding thoughts of the ancients, the Syrians and Arabs, and of mediæval Europe. Without due consideration of the Western folk-lore, the Chinese traditions, the elements of which are thoroughly based on Occidental ideas, would forever remain a sealed book. We are indebted to A. WYLIE¹ for a most scholarly study, *Asbestos in China*, which contains an almost complete array of Chinese sources relative to the subject; in fact, without his energetic pioneer-labor, the present investigation could not have been carried to the point to which it has now attained. My obligations to him for his able research-work are acknowledged in each and every case. The present state of science, however, has permitted me to go far beyond the results which Wylie was able to reach a generation ago. WYLIE² merely noted in the most general way that the accounts

¹ *Chinese Researches*, section iii, pp. 141—154 (Shanghai, 1897).

² *L. c.*, p. 149.

of the Chinese corroborate the statements of ancient classical writers, mainly emphasizing the point that the Chinese, in the same manner as the ancients, mention handkerchiefs or napkins woven from asbestos. No attempt, however, was made by him to explain all the curious lore that was lavishly accumulated on top of this subject. Here WYLIE¹ merely offered the remark, "The speculations of native writers as to the material of which it was made will probably not be thought equally worthy of credit with the bare recital of facts which came under their notice. In early times they appear not to have suspected that it was a mineral product, but have contented themselves with applying to the animal and vegetable kingdoms respectively for a solution of the difficulty." From the viewpoint of comparative folk-lore and Chinese relations with the West, these speculative theories which partially take their root in Hellenism certainly present most attractive material for study. Further, Wylie's representation of the matter suffers from various defects. It is not well arranged in chronological or any other order, and the sources are not sifted critically. Moreover, as admitted by himself, he did not succeed in identifying most of the geographical terms to be found in the Chinese texts.² At present this task is greatly facilitated, chiefly thanks to P. Pelliot's learned researches, which form the basis of many an important conclusion reached on the following pages. The geographical point of view is indispensable in this case, as only in this manner is it possible to trace the routes over which ideas have wandered.

By "asbestos" we understand the fibrous varieties of tremolite, actinolite, and other kinds of amphibole, the fibres of which are sometimes very long, fine, flexible, and easily separable by the fingers,

¹ *L. c.*, p. 144.

² Also HIRTH (*China and the Roman Orient*, p. 252) confessed that he was unable at the time when he wrote (1885) to identify these names.

and look like flax. The colors vary from white to green and wood-brown. The name "amiantus" is now applied usually to the finer and more silky kinds. Much that is called asbestos is chrysotile, or fibrous serpentine.¹ Asbestos, then, is a term of generic character, applied to the peculiar fibrous form assumed by several minerals, and not a name given to any one particular species; the asbestiform condition being simply a peculiar form under which many minerals, especially serpentine, occasionally present themselves. The varieties of asbestos are very numerous. They are all silicates of lime and magnesia or alumina, and commonly occur in crystalline rocks of metamorphic origin. The most valuable property of asbestos, its infusibility, is due to the large proportion of magnesia in its composition, which, like lime, has proved absolutely infusible at the highest temperatures attainable in furnaces or otherwise. Under the blowpipe a single fibre will fuse into a white enamelled glass or opaque globule, but in the mass some varieties have been known to resist the most intense heat without any visible effect. Chrysotile, however, if exposed for some time to long-continued heat, will lose somewhat of its tenacity and silkiness, and become rough and brittle.² The word "asbestos," then, in its present loosely-defined significance, is rather a commercial than a mineralogical term, and covers at least four distinct minerals, having in common only a fibrous structure and more or less fire and acid proof properties.³ It will be well to keep this in mind, as it cannot be expected that the Greek, Roman, Arabic, and Chinese writers, in their accounts of asbestos, should have in their minds a uniform and well-defined mineralogical species.

¹ E. S. DANA, *System of Mineralogy*, p. 399 (New York, 1893).

² R. H. JONES, *Asbestos, its Properties, Occurrence, and Uses*, pp. 13, 22, 23 (London, 1890).

³ G. P. MERRILL, *Notes on Asbestos and Asbestiform Minerals* (*Proc. U. S. Nat. Mus.*, Vol. XVIII, 1895, p. 281).

ASBESTOS IN CLASSICAL ANTIQUITY.—It is possible that Theophrastus (372—287 B.C.)¹ makes mention of asbestos, although this name does not appear in his writings. He states, “In the mines of Scaptesylos is found a stone, in its external appearance resembling rotten wood, which is kindled by oil poured over it; when the oil is consumed, the stone itself ceases to burn, as though it were not affected by fire.” Theophrastus discusses in this connection the different effects which the action of fire may bring about upon stones; but while he may have had asbestos in mind, this conclusion is by no means forcible. Others hold, for instance, that he speaks here of bitumen,² and this view seems more probable.

STRABO (circa 63 B.C.—A.D. 19; x, 1, § 6) states that “in the quarries near Carystus, at the foot of Mount Ocha in Euboea, is extracted a stone which is combed like wool, and spun and woven; of this substance, among other things, are made napkins (*χειρόμακτρα*) which, when soiled, are thrown into the fire, and whitened and cleaned, in the same manner as linen is washed.”³

¹ *De lapidibus*, 17 (opera ed. F. WINNER, p. 343).

² JOHN HILL, in his still very useful work *Theophrastus's History of Stones with an English Version, and Critical and Philosophical Notes* (p. 40, London, 1746), makes the following interesting comment on this passage: “It is much to be questioned whether this was the true original reading, and genuine sense of the author; in all probability some errors in the old editions have made this passage express what the author never meant to say. The substance, and indeed the only substance described by the other ancient naturalists as resembling rotten wood, is the gagates or jet before mentioned among the bitumens; but that has no such quality as the author has here ascribed to this stone of Scaptesylos. The ancients, it is to be observed, had a common opinion of the bitumens, that the fire of them was increased by water, and extinguished by oil; and very probably this was the sentiment originally delivered here by the author, however errors upon errors in different copies of his works may since have altered the sense of them. The stone itself was probably a bitumen of the lapis Thracicus kind, as the place from whence it has its name was a town of that country.”

³ Compare F. DE MÉLY, *Lapidaires grecs*, p. 14. Carystus (now Castel Rosso) was a city situated at the southern extremity of the island of Euboea, south of the mountain Ocha (now St. Elias). It was there that in 490 B.C. the Persian expedition under Datis and Artaphernes landed (HERODOTUS, VI, 99). At the time of Plutarch the mine was exhausted (see below). Celebrated was the marble of Carystus (mentioned also by Strabo).

DIOSCORIDES (v, 156) of the first century A.D., who designates asbestos by the name "amiant,"¹ says that this stone is found on Cyprus, and resembles alum, that may be cleft (στουπηρία σχιστή).² Being flexible, it is made by traders into tissues for the theatre. Thrown into the fire, they flame up, but come out more resplendent without having been attacked by the fire.³

APOLLONIUS DYSCOLUS, who lived in the first half of the second century A.D., has the following interesting notice on asbestos:⁴ "Sotacus, in his treatise on stones," says in regard to the stone called Carystius⁵ that it has woolly and downy excrescences, and that napkins are spun and woven from this mineral. It is twisted also into lamp-wicks which emit a bright light and are inexhaustible.⁷ When these napkins are soiled, their cleaning is performed not by means of washing in water, but brush-wood is burnt, the napkin

the quarries of which are still preserved (see LENZ, *Mineralogie der alten Griechen und Römer*, p. 59).

¹ Greek ἀμίαντος ("undefilable"), from μαιίνω ("to soil, defile").

² Regarding alum see M. BERTHELOT, *Collection des anciens alchimistes grecs*, Vol. I, p. 237.

³ F. DE MÉLY, *l. c.*, p. 24. The Arabic version (L. LECLERC, *Traité des simples*, Vol. II, p. 414) says that it resembles the alum of Yemen, and speaks of tissues without reference to theatrical use. J. YATES (*Textrinum Antiquorum*, p. 359) remarks that the epithet ἱμαντάδους may have referred to that variety of asbestos which is now called mountain-leather and commonly found with the fibrous asbestos.

⁴ *Historiae mirabiles*, XXXVI (*Rerum naturalium scriptores Graeci minores*, ed. KELLER, Vol. I, p. 52).

⁵ A work which is lost now. Sotacus lived in the third or perhaps even toward the close of the fourth century B.C. He is chiefly known to us from quotations in Pliny who cites him on seven occasions. Judging from the exact definitions of localities which he gave in order to determine stones and jewels according to their origin, he appears to have travelled a good deal, in Hellas and on the Greek islands. The then known world from India to Britannia and Aethiopia supplied him with material for observations; and his definitions, as we see from Pliny, were accepted as models by subsequent scholars. He dealt also with the employment of the single stones, particularly in medicine and magic (compare F. SUSEMIHL, *Geschichte der griechischen Litteratur in der Alexandrinerzeit*, Vol. I, pp. 860—861).

⁶ That is, stone from Carystus (see the above citation from Strabo).

⁷ Hence arose the name asbestos (ἀσβεστος) which means "inextinguishable."

in question is placed over this fire, and the squalor flows off; ¹ while the cloth itself comes forth from the fire brilliant and pure, and is again utilized for the same purposes. The wicks remain burning with oil continually without being consumed. The odor of such a wick, when burnt, tests and detects the presence of epilepsy in persons. ² This stone is produced in Carystus, from which place it received its name; in great abundance, however, on Cyprus, as you go from Geraudrus to Soli, ³ under rocks to the left of Elmaeum. At the time of the full moon the stone increases, and again it decreases with the waning of the moon." ⁴

PAUSANIAS (I, 26) narrates that the golden lamp made by Callimachus for the temple of Athene Polias in the Acropolis of Athens, which was kept burning day and night, had a wick of Carpasian flax (*λίλου Καρπασίου*), the only kind of flax that is indestructible by fire. ⁵ PLUTARCH (*circa* A.D. 46—120), in his *De oraculorum defectu*,

¹ This is a correct estimation of the process. The throwing into the fire of asbestos cloth, narrated in so many texts, Western and Eastern, is of course not to be taken literally; the cloth was simply put over a charcoal fire. There is no reason to accede to the opinion of J. T. DONALD (*Some Misconceptions concerning Asbestos, Engineering and Mining Journal*, Vol. LV, 1899, p. 250) that these stories "are to a large extent mythical; certainly, if true, the articles in question were not made of asbestos."

² PLINY (XXVIII, 63, § 226) says the same about the smell arising from burnt goat's horns or deer's antlers (*morbum ipsum deprehendit caprini cornus vel cervini usti nidor*).

³ A city on the north coast of Cyprus.

⁴ A similar observation is referred by PLINY (XXXVII, 67, § 181) to the selenitis ("moon-stone"), which contains an image of the moon, and reflects day by day the form of this luminary while waxing and waning, if this is true (*selenitis... imaginem lunae continens, redditque ea in dies singulos crescentis minuentisque sideris speciem, si verum est*). According to DIOSCORIDES (V, 159), the selenitis is found at night at the time of the waxing moon, and, pulverized, the stone is administered to epileptics. It thus seems that the last clause of Apollonius, as well as his reference to epilepsy, were inspired by traditions pertaining properly to selenitis. The latter, in my opinion, denotes a variety of mica, and it will be seen that the Chinese also know of a stone in which notions of mica and asbestos are blended. Ibn al-Baitār, in his Arabic rendering of Dioscorides' *Materia Medica*, translated the Greek *amiantos* by *al-falk* (that is mica, not our talc).

⁵ Asbestos from the vicinity of Carpasus, a town in the north-east corner of Cyprus, now called Carpas.

mentions napkins, nets, and kerchiefs of this material, but adds that it was no longer found in his time, only thin veins of it, like hairs, being discoverable in the rock.¹ There was further asbestine cloth for enveloping the ashes of cremated bodies, as stated by Pliny. As in other matters, so likewise on asbestos we owe to Pliny the most detailed notes.

PLINY knew asbestos of two localities,—Arcadia and India. That found in the mountains of Arcadia is of an iron color.² He has the following notice regarding asbestine cloth: "An invention has been made of a kind of material which cannot be consumed by flames. It is styled 'live,' and I have seen at banquets table-cloths made from it and burning over a fire. When the dirt was thus removed, they came forth from the fire brighter than water would have cleaned them. Funeral garments are made of this stuff for the kings to separate the ashes of the body from those of the pyre. This substance is found in the deserts of India scorched by the sun, where no rains fall, in the midst of deadly serpents, and thus becomes accustomed to live³ in the blaze. It is but rarely found, and difficult to weave owing to the shortness of its fibres. Its color is red by nature, and becomes white only through the action of fire. When found in its crude state, it equals the price of excellent pearls. In consequence of its natural properties it is called by the Greeks *asbestinon*.⁴ Anaxilaus⁵ is responsible for the statement that a tree enveloped by this linen is felled without the

¹ Among the Greek alchemists the word "asbestos" assumed the significance "lime;" thus Zosimus wrote a treatise on the latter under the title "Asbestos" (M. BERTHELOT, *Origines de l'alchimie*, p. 185).

² Asbestos in Arcadiae montibus nascitur coloris ferrei (XXXVII, 54, § 146).

³ *Vivere*; this description accounts for the above attribute "live" (*vivum*).

⁴ That is, inextinguishable, inconsumable.

⁵ A physician and Pythagorean philosopher who was banished by the Emperor Augustus in 28 B.C. on a charge of practising magic.

blows of the axe being audible. Hence this linen occupies the foremost rank the world over." ¹

In another passage Pliny mentions amiantus as resembling alum (*alumen*) in appearance, ² and losing nothing from the agency of fire. It resists all practices of sorcery, particularly those of the Magi. ³

The notes of the ancients are very plain, but deficient in facts. They give us the localities where asbestos was found, state the kind of products made from it, and point out its power of resistance to fire. We hear nothing, however, about the mode of mining the mineral, or preparing, spinning, and weaving its fibres. ⁴ Above all, it should be borne in mind that no theory regarding the origin and nature of asbestos is handed down to us from classical antiquity. Pliny's idea that its fire-resisting quality is bred by the tropical sun of India, can hardly be regarded as such, and is no more than an expression of his personal opinion. Several authors, it is true, have ascribed to Pliny a belief in the vegetal origin of asbestos, but this is an unfounded assumption. DANA ⁵ peremptorily says that Pliny supposed asbestos to be a vegetable product. BOSTOCK and RILEY, ⁶ pointing to the word *mappa*, as boldly assert that "he

¹ Inventum iam est etiam quod ignibus non absumeretur. Vivum id vocant, ardentisque in focis conviviorum ex eo vidimus mappas sordibus exustis splendescentes igni magis quam possent aquis. Regum inde funebres tunicae corporis favillam ab reliquo separant cinere. Nascitur in desertis adustisque sole Indiae, ubi non cadunt imbres, inter diras serpentes, adulescitque vivere ardendo, rarum invento, difficile textu propter breviter. Rufus de cetero colos splendescit igni. Cum inventum est, aequat pretia excellentium margaritarum. Vocatur autem a Graecis ἀσβέστηνον ex argumento naturae. Anaxilaus auctor est linteo eo circumdatam arborem surdis ictibus et qui non exaudiantur cecidi. Ergo huic lino principatus in toto orbe (XIX, 4).

² AULUS GELLIUS (*Noctes atticae* [circa A.D. 175] xv, 1) mentions a wooden tower for the defence of the Piraeus, which could not be set on fire by Sulla, because it was coated with alum.

³ Amiantus alumini similis nihil igni deperdit. Hic beneficiis resistit omnibus, privatim Magorum (XXXVI, 31, § 189).

⁴ BLÜMNER, *Technologie*, Vol. I, 2d ed., p. 205.

⁵ *System of Mineralogy*, p. 389.

⁶ *Natural History of Pliny*, Vol. III, p. 136.

evidently considers asbestos to be a vegetable, and not a mineral production." ¹ Pliny indeed makes no statement whatever to the effect that asbestos is a plant or the product of a tree, as we hear, for instance, in China; neither is there any such testimony in any other classical source. On the contrary, all Greek authors distinctly speak of asbestos as a mineral. Moreover, Pliny most positively regarded both asbestos and amiantus as minerals; otherwise he would not have listed them, as we have seen, in his books xxxvi and xxxvii, which are devoted to mineralogy. For this reason I am convinced that throughout classical antiquity asbestos was considered as nothing but a mineral substance. This is most strongly corroborated by the fact that the ancients were familiar with at least three mines in their own dominion,—Carystus, Cyprus, and Arcadia; and the people who mine asbestos are assuredly familiar with its true nature, and cannot possibly believe in its vegetal provenience. Pliny has inserted his principal notice of asbestos in his book on textiles, because it was as a textile that the substance was chiefly utilized and known. Certainly this textile deserved the name "linen;" in fact, it could not have been termed anything else. We ourselves still speak of asbestos-cloth, and entertain no thought of a vegetable product in this connection. There are vegetal, animal, and mineral fibres, and any material woven from these may be called cloth. The verb *nascitur* ("it is born, it grows"), used by Pliny, does not allow of inferences, any more than the word *linum*. This term does not necessarily refer to plant-life; on the contrary, Pliny employs it also with reference to minerals. Thus the Indian *adamas* does not "grow" (that is, occur) in a stratum of gold. ²

¹ Even so cautious a worker as E. O. VON LIPP MANN (*Abhandlungen*, Vol. 1, p. 17) wrongly makes Pliny say that asbestos is an incombustible flax. Pliny does not express himself in this manner.

² *Indici non in auro nascentis* (xxxvii, 15, § 56); or the *selenitis* is said to grow in

The notion of the vegetal character of asbestos, indeed, did not exist in classical antiquity, but it is Hellenistic and seems to have sprung up somewhere in the anterior Orient. The earliest source to which I can trace it is the Greek Alexander Romance (*Pseudo-Callisthenes*, III, 22) in which is described a dining-room of imperishable wood in the palace of Queen Candace,—not exposed to putrefaction, and inconsumable by fire. Other manuscripts, however, read ἀμιάντων and “stones” instead of “wood;” so that the passage is now rendered, “There was there also a dining-room of incombustible amiantus.”¹ A Syriac work on natural history of uncertain date, wrongly ascribed to Aristotle, in which Syriac translations of the Homilies of Basilus the Great and the Physiologus and several other unknown books have been utilized, makes a distinct allusion to an “asbestos tree:” “This tree is styled ‘The Constant One.’ When a man takes a piece of it and flings it into a very hot bath, the latter becomes tepid, as though it had never experienced fire. Also a fire-stove which is set in flames is extinguished and cools off; likewise a baking oven and chimney is extinguished as soon as a piece of that tree is thrown into them.”² This notice is followed in the same work by the description of the salamander, which, as will be noticed farther on, plays such a signal part in the mediæval legends of asbestos. The tree-asbestos was adopted also by the Arabic writer Abū Dulaf (below, p. 329). It turns up also in China.

The scarcity of information which the ancients have left to us on the subject of asbestos is to some extent made good by three relics of asbestos tissues still preserved in Italy. One found at Puzzuolo in 1633 belonged to the Gallery Barberini. Another, in

Arabia (nasci putatur in Arabia [67, § 181]). In a similar manner *croître* was employed in French: R. DE BERQUEN (*Les merveilles des Indes orientales*, p. 15, Paris, 1669), for instance, has, “Cette precieuse pierre croist en plusieurs endroits du monde.”

¹ A. AUSFELD, *Der griechische Alexanderroman*, p. 99.

² K. AUHENS, *Buch der Naturgegenstände*, p. 80.

the Library of the Vatican, was discovered in 1702 a mile outside of the Gate of Rome, called Porta Maior; it was a corpse-cloth, five feet wide and six feet and a half long, coarsely spun, but as soft and pliant as silk, enclosing the skull and calcined bones of a human body,—discovered in a marble sarcophagus, thus furnishing a remarkable confirmation of Pliny's statement. The deceased, judging from the sculptured marble, was a man of rank who is supposed to have lived not earlier than the time of Constantine. A third piece of asbestine cloth, of considerable dimensions, is shown in the Museum Borbonico at Naples; it was found at Vasto in the Abruzzi.¹

The early Chinese notices of asbestos bear the same sober character as those of the classical authors.

EARLY IMPORTATION OF ASBESTOS INTO CHINA.—The Chinese first became acquainted with asbestos through their trade with the Roman Orient. Indeed, the first authentic notices of a product from this mineral in the Annals refer to the territory of western Asia. The *Wei lio* 魏略, written by Yü Huan between 239 and 265,² enumerates asbestos-cloth among the products frequently found in Ta Ts'in (the Roman Orient).³ The same statement is made in the Annals of the Later Han Dynasty;⁴ likewise in those of the Tsin and Liu Sung Dynasties.⁵ The fact that Ta Ts'in produces asbestine cloth is mentioned also in the famous Nestorian inscription of Singan fu. The term used in the Annals is *huo huan pu* 火浣布 (literally, "cloth which can be cleansed by fire"), evidently suggested by the stories of the ancients. After the example of WYLIE,⁶ I use

¹ J. YATES, *Textrinum Antiquorum*, pp. 359, 360.

² See CHAVANNES, *Toung Pao*, 1905, pp. 519—520; and PELLIOT, *Bull. de l'École française*, Vol. VI, 1906, p. 364.

³ HIRTH, *China and the Roman Orient*, p. 74.

⁴ *Hou Han shu*, Ch. 118, p. 4 b.

⁵ HIRTH, *l. c.*, pp. 40, 45, 46, 61; CHAVANNES, *Toung Pao*, 1907, p. 183.

⁶ *Chinese Researches*, section III, p. 141.

the term "fire-proof cloth" as a convenient synonyme, though this meaning is not directly conveyed by the Chinese expression.

The alleged philosopher Lie-tse¹ mentions a tribute of asbestos-cloth to King Mu of the Chou dynasty (1001—946 B.C.) on the part of the Western Jung. Asbestos is characterized there as follows: "The fire-proof cloth, in order to be cleansed, was thrown into the fire. The cloth then assumed the color of fire, and the dirt assumed the color of the cloth. When taken out of the fire and shaken, it was brilliantly white like snow." This text is not authentic, but retrospective, and cannot be older than the Han period. In the same manner as the diamond was a product hailing from the Roman Orient, so also was asbestos.²

In like manner the text of the *Chou shu* 周書,³ alluding to the same event as that of Lie-tse, is of a purely retrospective character, and devoid of chronological value.⁴ The matter, indeed, is not connected with King Mu or the Chou dynasty; but the fact is borne out by these two texts that under the Han (206 B.C.—A.D. 220), asbestos-cloth, together with diamond-points, was imported into China over a land-route leading from the Roman Orient by way of Central Asia.⁵

¹ Ch. 5, *T'ang wén*.

² WYLIE (*l. c.*, p. 142) seems to regard Lie-tse's text as historical; and HIRTH (*China and the Roman Orient*, p. 250) even goes so far as to say, that if the philosopher Lie-tse, whose writings are said to date from the fourth century B.C. (A.D. in Hirth's book is a misprint), can be trusted, asbestos-cloth was known in China as early as a thousand years B.C. E. FABER (*Naturalismus bei den alten Chinesen*, p. 132), in his translation of Lie-tse, justly wondered that things like asbestos were already known in times of such hoary antiquity; but certainly they were not. The alleged *kun-wu* 鍔 鍔 sword mentioned in Lie-tse is not, as hitherto believed, a sword, but a diamond-point.

³ See CHAVANNES, *Mémoires historiques de Se-ma Ts'ien*, Vol. V, p. 457.

⁴ The text of the *Chou shu* has passed into the *Po-wu-chi* (Ch. 2, p. 4b, ed. printed at Wu-ch'ang).

⁵ King Mu was the chosen favorite and hero of Taoist legend-makers, to whose name all marvellous objects of distant trade were attached (in the same manner as King Solomon and Alexander in the West). The introduction of the Western Jung is emblematic of the intermediary rôle played by Turkish tribes in the transmission of goods from western Asia to China.

Wylie was inclined to believe that the earliest allusion to asbestos occurs in the *Shi i ki* 拾遺記, where it is said that the people of Yü-shan 羽山 brought yellow cloth for presentation to the Emperor Shun. This, according to him, is not very distinct; but as we learn from the same authority that the same nation, on two later occasions, brought an offering of fire-proof cloth, it seems not unfair to infer that the former offering was of a similar character. That work, however, as stated by WYLIE elsewhere,¹ has little historical value. It was written by Wang Kia 王嘉 of the fourth century; but this work is not preserved, having been afterwards disarranged and partially destroyed. Even if the passage in question were traceable to Wang Kia, our belief in it would not be strengthened; for no authentic work of the pre-Christian era contains any allusion to this matter. Asbestos was found on Chinese soil only in post-Christian times; and Chinese notions regarding asbestos being, as will be seen, to a large extent based on Western folk-lore, it is reasonable to conclude that the Chinese were not acquainted with asbestos before their contact with the Roman Orient. The various accounts of the *Shi i ki* about tributes of asbestos, however, point to the fact that this material came from Western regions.

General Liang-ki 梁冀, who lived under the Emperor Huan 桓 (147—157) of the Han dynasty,² had a costume made from asbestos-cloth, which he used to wear on the occasion of great banquets. He would insist on declining the wine-cup till it was spilled on his suit; and then with feigned anger he would take it off, ordering it to be thrown into the fire. It blazed up as if it were reduced to ashes; but the stains being removed, and the fire extinguished, the cloth appeared bright and clean, as if it had been purified with lees.³

¹ *Notes on Chinese Literature*, p. 192.

² He died in 159 (GILES, *Biographical Dictionary*, p. 478).

³ Compare WYLIE, *Asbestos*, p. 143. This text is handed down under the name of

A report of incontestable authenticity concerning asbestos-cloth being sent as tribute to China refers to the second month of the year 239, in the time of the Three Kingdoms, when envoys from an unnamed country of the Western Region (*Si Yü*), introduced at the Court by means of double interpreters, offered fire-proof cloth to Ts'i Wang Fang 齊王芳 (240—253) of the Wei dynasty. The Emperor directed his military staff to test it, and to proclaim the result to the officers.¹ The intention was perhaps implied to make use of this material for army purposes. Under the Wei, also, the tradition was upheld that early under the Han, gifts of such cloth had been presented by Western countries. Two sovereigns of the Wei lent expression to an ill-founded scepticism as to the actual existence of this substance,—a belief which was not shared by the Taoist Ko Hung 葛洪 of the fourth century.² Ko Hung inaugurates a new period in the study of this subject on the part of the Chinese. Under the Han and throughout the third century, the Chinese accepted asbestos products as a fact, without inquiring into the nature of the mineral or the causes of its wonderful properties. They were satisfied to state merely the effects of its properties. Ko Hung is the first Chinese author to render an account of the origin of asbestos in the romantic spirit appropriate to the Taoist school. The ideas which he expounded, however, are closely inter-

Fu-tao 傅子, who lived in the latter part of the fourth century, and appears in P'ei Sung-chi's commentary to *San kuo chi* (*Wei chi*, Ch. 4, p. 1). HIRTH (*China and the Roman Orient*, p. 251) wrongly ascribes it to the text of *Wei chi* itself; he aptly reminds us of the jest practised by the Emperor Charles the Fifth, who astonished his guests after dinner by exposing an asbestos table-cloth to a fire. In the *Encyclopædia Britannica* (Vol. II, p. 714) this anecdote is connected with Charlemagne; R. H. JONES (*Asbestos*, p. 3) allows both Charleses to pass. The one attribution is as true as the other.

¹ *San kuo chi* (*Wei chi*), Ch. 4, p. 1.

² These texts have been translated by WYLIE (*l. c.*, pp. 150—151); they are therefore not reproduced here, especially as they bear no immediate relation to our subject, which is to trace the development of Chinese notions of asbestos in their dependence on Western beliefs. Compare also the analogous text in the *Yü kien* 寓簡 (WYLIE, *Notes*, p. 165), Ch. 3, p. 2 b (ed. of *Chi pu tsu chai ts'ung shu*).

twined with those which the further development of the matter at the end of the classical period in the Occident brought to life. The sober and prosaic notices of the Han and Wei periods thoroughly coincide with those of the classical authors, while Ko Hung's thoughts are on the same level as those of the post-classical writers. In their efforts to find a plausible explanation for the origin of asbestos, the Taoist nature-philosophers directed their thoughts toward the animal and vegetable kingdoms, now explaining it as the hair of a beast, now as the fibre of a plant, and also, through the introduction of the activity of a volcano, welding these two theories into one. Nobody as yet has unravelled the mystery of how these strange speculations arose. ¹ As regards the supposed animal origin of asbestos, the gist of the Chinese accounts in general is that there is a fiery mountain (volcano) on which lives an animal lustrous with fire, about the size of a rodent, covered with hair of unusual length and as fine as silk. Ordinarily it dwells in the midst of the fire, when its hair is of a deep-red color; but sometimes it comes out, and its hair is then white. On a dark night the forest is visible from the reflection of the animal's lustre. It is put to death by being sprinkled with water, whereupon its hair is spun and woven into cloth, which makes what is called fire-proof cloth. If the cloth becomes soiled, it is purified by fire. The solution of this riddle may be betrayed in advance: the Chinese animal yielding asbestos

¹ CHAVANNES (*Bulletin de l'École française*, Vol. III, p. 438) indicates an interesting text in *Pei shi* (Ch. 97, p. 2), according to which the Emperor Yang (605—616) of the Sui dynasty despatched Wei Tsie and Tu Hing-man on a mission to the countries of the west; in the kingdom of Shi (Kesh, at present Shühr-i-sabz) they took ten dancers, lion-skins, and hair of the rat which enters the fire (*huo shu mao*). Chavannes cites the definition given of this animal in the *Ku kin chü*, "The fire-rat enters the fire without burning; its hairs are over ten feet long; they can be made into a textile known as 'cloth washable in the fire.'" "Ce sont des fibres d'amianté ou asbeste qu'on présentait aux Chinois comme étant les poils d'un animal merveilleux," is the comment added by M. Chavannes.

is a disguise of the classical salamander, whose hair or wool was believed by the Arabs and mediæval Europe to furnish the material for asbestos textiles. The history of this subject must be studied in detail to arrive at a correct appreciation of the Chinese traditions, which, on their part, are of sufficient extent and importance to throw light back on the development of the matter in the West.

THE SALAMANDER IN GREEK AND ROMAN LORE.—An animal by the name of salamander is first mentioned by ARISTOTLE (384—322 B.C.): “On the Island of Cyprus, where copper-ore is smelted and accumulates for many days, animals are developed in the fire, somewhat larger than the big flies with short wings that go hopping and running through the fire. They die when removed from the fire. The possibility, however, that the bodily substance of some animals is not destroyed by fire, is proved by the salamander; for this creature, as it is said, will extinguish the fire while passing through it.”¹

AUBERT and WIMMER, in their edition of Aristotle’s work,² reject this passage as unauthentic, and presumably with good reason. Aristotle does not mention this animal in any other passage, and it is not clear from his text what kind of animal he understands by *salamandra*; it is also difficult to credit a scholar of the intellectual calibre of Aristotle with the belief in animals crossing fire unhurt, which belong, not to natural history, but to the realm of fable.

THEOPHRASTUS (372—287 B.C.), Aristotle’s great disciple, mentions the salamander in two of his writings as an animal which he apparently knew from personal experience. He enumerates “the lizard,

¹ “Ὅτι δ’ ἐνδέχεται μὴ κάεσθαι συστάσεις τινὰς ζῴων, ἢ σαλαμάνδρα ποιῆι φανερόν· αὕτη γάρ, ὡς φασί, διὰ πυρὸς βαδίζουσα κατασβέννυσι τὸ πῦρ (*Historia animalium*, v, 19, § 106).

² *Aristoteles Tierkunde*, Vol. I, pp. 119, 515

which is called the salamander," together with birds and the green frog, among the animals whose appearance prognosticates rain.¹ In his treatise on fire he discusses means of counteracting the force of conflagrations; for instance, vinegar, and vinegar mixed with the white of an egg. "If the power of cold is added to such a fluid," he continues, "this co-operates toward the extinction of fire, and this property is said to be found in the salamander; for this creature is cold by its nature, and the fluid flowing out of its body is sticky, and at the same time contains such a juice that it penetrates forward. This is shown by water and fruits which, when touched by it, become injurious, and usually have a deadly effect. The animal's slowness of motion is also of assistance; for the longer it tarries in the fire, the more it will contribute toward its extinction. However, it cannot extinguish a fire of any dimensions, but only one commensurate with its nature and physical ability; and a fire in which it did not dwell long enough will soon light up again."² Also Theophrastus, in the same manner as his master, reproduced a popular opinion of his time, as seen by his addition "it is said" (*Φασι*); but compared with Aelian and Pliny, he is rational and reasonable to a high degree.³

ÆLIAN⁴ tells the following story of the salamander: "The salamander is not a product of fire, nor does it rise from the latter like the so-called pyrigoni;⁵ yet it does not fear fire, but, going against the flame, the animal tries to combat it like an adversary. The witnesses to this fact are the artisans and workmen dealing

¹ Καὶ ἡ σαύρα φαινομένη ἦν καλοῦσι σαλαμάνδραν, ἔτι δὲ καὶ χλωρὸς βάτραχος ἐπὶ δένδρου κέδων ὕδωρ σημαίνει (*De signis tempestatum*, 15; opera, ed. WIMMER, p. 391).

² *De igne*, 60 (opera, ed. WIMMER, p. 361).

³ The important text of Antigonus of Carystus will be discussed in another connection (see below).

⁴ *De natura animalium*, II, 31.

⁵ The insects mentioned in the text of Aristotle quoted above.

with fire. As long as their fires flame up brightly and further their labor, they pay no attention to this creature; but when the fires go down and become extinguished, and the bellows blow in vain, they become aware of the counteraction of the animal. Then they trace it out and visit their vengeance upon it; thereupon the fire rises again, and assists their work." In another passage of the same work (ix, 28) Aelian asserts that the hog, when swallowing a salamander, is not hurt, while men partaking of its flesh are killed. The same is expressed by Pliny: "Those in Pamphylia and in the mountainous parts of Cilicia who eat a boar after it has devoured a salamander will die, for the danger of poison is by no means indicated in the odor or taste of the meat; water and wine in which a salamander has perished, even if it has only drunk of the beverage, will also have a mortal effect." ¹ In the zoölogical portion of his great work, Pliny describes the animal thus: "The salamander is an animal of the shape of a lizard, with a star-like design. It never comes out except during heavy rains, and disappears when the sky becomes serene. Such intense cold inheres in this animal, that by its mere contact, fire will be extinguished, not otherwise than by the action of ice. The milky mucus flowing from its mouth, whatever part of the human body it may touch, causes all hair to fall off; and the spot thus touched assumes the appearance of tetter." ²

In Book xxix, where he treats the remedies derived from the animal kingdom, Pliny has devoted another chapter to the salamander.

¹ *Apros in Pamphylia et Ciliciae montuosis salamandra ab iis devorata qui edere, moriuntur: neque enim est intellectus ullus in odore vel sapore; et aqua viamque interemit salamandra ibi inmortua vel si omnino biberit unde potetur (xi, 53, § 116). In xxix, 23, he dilates still further on the subject.*

² *Sicut salamandrae, animal lacertae figura, stellatum, nunquam nisi magis imbris proveniens et serenitate desinens. Huic tantus rigor, ut ignem tactu restinguat non alio modo quam glacies. Eiusdem sanie, quae lactea ore vomitur, quaecumque parte corporis humani contacta toti defluunt pili, idque, quod contactum est, colorem in vitiliginem mutat (x, 67, § 188).*

The most interesting point that he makes there is this: "If the assertion of the Magi were true, that the animal is helpful in conflagrations, since it is the only creature able to extinguish fire, this experience would long ago have been made in Rome; Sextius also rejects this statement as incorrect."¹ This passage shows that there were men who disavowed this popular belief; and they are headed by Dioscorides, who affirms that it has been said, and wrongly, that the salamander remained immune on entering fire.² Further, Pliny imputes the superstition to the Persian Magi; and it may, indeed, have spread into the antique world with the diffusion of the Mithraic cult into Rome.

O. KELLER³ also holds that the fables about the salamander betray Oriental origin, but he has not succeeded in tracing their sources.⁴ Pliny's and Aelian's stories doubtless go back to the Alexandrian Physiologus, whether they may have drawn upon this work directly, or received them by way of oral tradition flowing from Alexandria. The *Physiologus* (Ch. 31) states that the salamander entering a fire-stove extinguishes the fire;⁵ and the same is found

¹ Ex ipsa quae Magi tradunt contra incendia, quoniam ignes sole animalium extinguat, si forent vera, iam esset experta Roma. Sextius...negatque restingui ignem ab iis.

² L. LECLERC, *Traité des simples*, Vol. II, p. 235.

³ *Antike Tierwelt*, Vol. II, p. 321. Keller neglected the fundamental passage of Theophrastus regarding the salamander.

⁴ The evidence produced by Keller in favor of the Oriental origin is rather perplexing. The name "salamander," which cannot be explained from Greek, indubitably comes from Asia. Arabic and Persian offer the name by omitting the syllable *al*, and the word thus abbreviated is said to mean "poison within." It is of course impossible to derive the Greek name from Persian or Arabic; on the contrary, Arabic *samandal* سَمَنْدَل, *samandar*, *samaisdar*, *semendel*, *semendul*, *samand*, *sandal*, and Persian also *sālāmandirā* سالامندرا, are derived from Greek *salamandra*, as admitted by all competent philologists (F. HOMMEL, *Namen der Säugetiere bei den südsemitischen Völkern*, p. 33; the Ethiopic Physiologus still offers the form *salmandar*; STREINGASS, *Persian-English Dictionary*, p. 642; YULE, in his *Marco Polo*, Vol. I, p. 216). The derivation from Persian *sūm* سام ("fire", not "poison," which is *samm* سم, an Arabic word) and *andar* ("within") certainly rests on mere playful popular etymology.

⁵ F. LAUCHERT, *Geschichte des Physiologus*, pp. 27, 261.

in the *Hieroglyphica* of the Egyptian priest Horapollon of the fourth century A.D.¹ The tradition, accordingly, must have been current in Egypt as early as the first or second century. Let us note right here that the *Physiologus* (Ch. 7) tells also the legend of the phœnix which cremates itself in the Temple of the Sun at Heliopolis, how on the ensuing day arises from the ashes a worm, which develops on the second day into a young bird, till on the third the phœnix itself comes out therefrom in its previous shape; for this notion has likewise been associated with the attempts to account for the origin of asbestos,—asbestos, salamander, and phœnix, all representing or yielding matters going through fire unscathed. The *Physiologus* contains no reference to asbestos; and it must be emphasized that the assimilation of the three has not taken place in classical antiquity, during which they were clearly separated. A wondrous and fabulous book of the type of the *Cyranides*, a late Greek work written between 227 and 400, would not have missed this opportunity, had such an assimilation then existed among the Greeks; but it does not mention a fire-proof textile spun from the animal's hair.²

THE SALAMANDER AND PHŒNIX AMONG THE ARABS.—Old D'HERBELOT,³ even, knew that the Arabic word *samandar* designates the animal styled by us "salamander," and that Oriental authors are not in accord as to its species,—the one taking it for a kind of marten,

¹ F. HOMMEL, *Æthiopische Ueb. d. Physiologus*, p. XXXII.

² F. DE MÉLY, *Lapidaires grecs*, p. 91. This work defines the salamander as a quadruped bigger than the green lizard, and Pliny and Dioscorides also take it for a lizard. O. KELLER'S (*l. c.*, p. 318) identification with *Salamandra maculata* — that is, the animal now called by us salamander (or eft, newt) — seems to me arbitrary. The amplifications of the *Cyranides* are interesting: the animal's heart renders him who carries it with him fearless of fire, intrepid in a conflagration, and incombustible; and when its heart is worn as an amulet by people burnt with fever, the fever will at once abate, etc.

³ *Bibliothèque orientale*, Vol. III, p. 192.

its hair being made into a strong stuff, which can be thrown into fire to be cleansed, when it is soiled, without being in the least damaged; others taking it for a kind of bird generated and consumed in the fire, and found only in places where a perpetual fire is entertained; others, again, describing it as an insect or reptile like a lizard,—but neither D'HERBELLOT nor YULE¹ noticed that the salamander as a bird (his product "salamander's plumage" being the equivalent of "asbestos") is no other than the masqueraded phoenix of the ancients.² The climax of these curious adjustments is reached by Damiri (1344—1405), in his *Hayāt al-hayawān*, who notes the phoenix under the title "salamander," describes it as an animal like a fox or marten, and attributes to it the yielding of asbestos: "Samanḍal سمندل is a certain bird that eats *al-bīš* البيش (aconite), which is a plant found in the land of China, where it is edible. It is green in that country; and when it is dry, it becomes a kind of food for the people of China without any injurious effect on them. But if it be taken away from China, even to a distance of a hundred cubits, and is then eaten, the eater of it dies instantaneously."³

¹ *The Book of Ser Marco Polo*, Vol. I, p. 216.

² JULIUS CAESAR SCALIGER (*De subtilitate ad Cardanum*, fol. 305 b, Lutetiae, 1557), however, identified it with the phoenix, "which is not entirely fabulous, but, as we read in the navigators, occurs in the interior of India, and is called by the natives *semenda*."

³ This story is found in (and is probably copied from) Ibn al-Baitār (1197—1248), who quotes Ibn 'Semdjun as follows: "Some physicians report that the plant *bīš* بيش grows in China toward the frontier of India, in a country called Halābil, where alone it occurs. It is eaten as a vegetable in the country of Halābil, toward the frontier of India. In a dried state it is an article of food for the people of the country, who experience no harm from it. When taken out of that country, if only to a distance of a hundred paces, it acts as a poison, instantly killing him who eats of it" (L. LECLERC, *Traité des simples*, Vol. I, p. 298). This text is important, inasmuch as it shows that the consumption of edible aconite did not take place in China, as Damiri wrongly asserts, but in a border state of the Himalayan region of northern India. Damiri's allegation appears embarrassing, as "the Chinese do not seem to have considered any of the aconites as edible" (G. A. STUART, *Chinese Materia Medica*, p. 11); neither does BRETSCHNEIDER (*Bot. Sin.*, pt. 3, pp. 252—257) know anything about such a practice. The statement of the *Pie lu* regarding one variety of aconite, that it is of a sweetish taste, only shows that there is a non-

A wonderful thing in connection with the phoenix is that it takes pleasure in fire and in remaining in it. When its skin becomes dirty, it cannot be cleansed except by means of fire. It is found largely in India.¹ It is an animal smaller in size than the fox, piebald in color, with red eyes and a long tail. Sashes are woven of its soft hair; and when they become dirty, they are thrown into fire, upon which they become clean without being burnt. Other authorities assert that the phoenix is a bird found in India, that

poisonous aconite in China. On the other hand, we know that in India only two varieties of *Napellus* are poisonous, — *Napellus* proper and *Aconitum rigidum* — while the two others, *Aconitum multifidum* and *A. rotundifolium*, are harmless and are eaten in Bhutan (HOOKER, *Flora of British India*, Vol. I, p. 29). According to FLÜCKIGER and HANBURY (*Pharmacographia*, p. 15), the tubers of *Napellus* are taken in Kunawar as aphrodisiac. Arabic *bīš* is derived from Hindi *bīš*, the latter from Sanskrit *viśā* (*visha*, "poison"), *Aconitum ferox* (*ativishā*, *Aconitum heterophyllum*; HOERNLE, *Bower Manuscript*, p. 186). The word appears in al-Bērūnī (SACHAU, *Alberuni's India*, Vol. II, p. 159) and in Qazwīnī, who describes how the fabulous poisonous girls of India are reared on it (SILVESTRE DE SACY, *Chrestomathie arabe*, Vol. III, p. 398). Regarding aconite in India, see WATT, *Dictionary of Economic Products of India*, Vol. I, pp. 84–99 (also published as a separate pamphlet in the series *Agricultural Ledger*, No. 3, 1902); in Tibet, H. LAUFER, *Beitr. zur Kenntnis der tib. Med.*, p. 57. Much valuable and interesting material on Western and Eastern beliefs in aconite poison and its effects has been gathered by W. HERTZ, *Sage vom Giftmädchen* (*Abh. bayer. Akad.*, Vol. XX, 1893, pp. 48–52). Of course, it is not the phoenix which feeds on aconite, but the salamander as a venomous animal. Its poisonous character, inherited from the classical authors, is explained by the Arabs through this process of nutrition.

¹ PLINY (XIX, 4) attributed asbestos to the deserts of India, where, under the scorching rays of the tropical sun and among numerous deadly serpents, it acquires the property of resisting fire. Hierocles, a Greek writer of the sixth century A.D., says of the Brahmans of India that their garments are made of the soft and skin-like fibres of stones, which they weave into a stuff that no fire burns or water cleanses; when their clothes get soiled, they are thrown into a blazing fire, and come out quite white and bright (MCCRINDLE, *Ancient India as descr. in Class. Lit.*, p. 186). G. WATT (*Dictionary of the Economic Products of India*, Vol. I, p. 338) mentions two localities, — the Gokāk Taluka, in the Belgaum district in the southern Maratha country, where asbestos is used as an external application in ulcers, made into a paste, after rubbing it down with water; and the country to the south and west of the Kurum River, Afghanistan, where it is medicinally employed and made into brooms and rough ropes, and padding for saddles. Watt imparts a vernacular name for asbestos, *shankha* [*ṣaṅkha*]-*palita*, which he translates "wick made of shells." On Ceylon, asbestos is found, but is not mined commercially (J. C. WILLIS, *Ceylon*, p. 3, Colombo, 1907).

lays its eggs and produces its young in fire. It possesses the property of being unaffected by fire. Sashes are made of its feathers and taken to Syria. If one of them becomes dirty, it is thrown into fire, which consumes the dirt over it, but the sash itself is not burnt. Ibn-Khallikān states, 'I have seen a thick piece of it woven in the shape of a belt for a riding beast throughout its length and breadth. It was put into fire, but the fire had no effect on it whatever. One end of it was then dipped in oil and left over the burning wick of a lamp, upon which it lighted up and remained so for a long time, after which the flame was extinguished; and it was found to be in the same condition as before, unaltered in any way.' He further states, 'I have read in the writing of our shaikh, the very learned Abd-al-Laṭīf, that a piece of *samandal* a cubit in breadth and two cubits in length was presented to the sovereign of Aleppo. They kept on dipping it in oil and lighting it up, until the oil was exhausted, but yet it remained as white as it was.'" Farther on, Damīrī mentions the salamander under the name *samandar* سمندر and *samaidar* سميدار as "a certain animal well known to the people of India and China, according to Ibn-Sidah."¹

Damīrī has compiled his information from the writings of his predecessors. The earliest Arabic notice of the *samandal*-phœnix, as far as I know, occurs in the *Adjaib al-Hind* عجائب الهند ("The Wonders of India"), written in the tenth century, where the bird is localized on one of the Islands of Waqwaq الوقواق: "It can enter fire without burning itself, and remain there long without eating anything but earth."² This work, however, while naming the phœnix

¹ A. S. G. JAYAKAR, *Ad-Damīrī's Zoological Lexicon*, Vol. II, pt. 1, pp. 79—81 (Bombay, 1908). G. FERRAND (*Textes relatifs à l'Extrême-Orient*, Vol. I, p. 248) objects to Jayakar's translation of *samandal* by "phœnix;" but Jayakar is certainly right. The three ideas of asbestos, salamander, and phœnix are assimilated in this notion.

² LITH and DEVIC, *Livre des merveilles de l'Inde*, p. 173. L. M. DEVIC, in his separate translation of this work (p. 204, Paris, 1878), has this comment: "Semendel ou

for the salamander, makes no reference to a fire-proof textile obtained from the animal. As shown below (p. 328), the geographer Yaqūt (1179—1229) mentions the popular belief that asbestos is the plumage of a bird. In regard to the Caliph Māmun, it is told that the Indian King Dehim presented him with a skin of the bird *samandal* which no fire was able to consume.¹

If the Chinese, as will be seen, made the salamander a rodent, this zoölogical feat meets a parallel among the Arabs. Qazwīnī enumerates the *samandalun* or *sandalun* as his fifth kind of rat, and describes it as a species of rat that enters fire, recording the same as DAMIRI relates about the phœnix (above, p. 319); adding

Semendoul est le nom arabe et persan de la salamandre, animal fantastique sur la nature duquel les Orientaux ne s'accordent guère; les uns en font un quadrupède, d'autres un oiseau, d'autres enfin un reptile, tous lui attribuant d'ailleurs la faculté de vivre dans le feu sans se brûler. Marco Polo désigne par ce nom l'amiante." No Arabist as yet seems to have conceived the notion that this tradition becomes intelligible only if we combine the three classical traditions concerning asbestos, salamander, and phœnix associated in post-classical time by the common idea of their incombustibility; hence we meet in Arabic literature accounts of asbestos termed "salamander" which is an animal interpreted as a reptile, phœnix, and finally also as a mammal. — G. FERRAND (*Journal asiatique*, 1904, Mai-Juin, pp. 489—509) has advanced the theory that the one of the two Wāqwāq spoken of by the Arabic writers should be identified with Madagascar (the other is Japan, *Wa-kuok* 倭國; compare also the notice of CHAVANNES, *Toung Pao*, 1904, pp. 484—487). In an additional notice (*Journal asiatique*, 1910, Mars-Avril, pp. 321—327) FERRAND admits that Wāqwāq may be identified also with Java-Sumatra. In his admirable work *Textes relatifs à l'Extrême-Orient* (Vol. I, p. 17), he adds to these possibilities also East Africa. While not contesting the ingenuity of Ferrand's theory, it is not convincing in all parts (it is chiefly based on the supposed etymology of Wāqwāq being derived from the native names for Madagascar, *Vahuaka*, and for the tree *sakua*). The authority of al-Bērūnī, however, is not to be disparaged, according to whom Wāqwāq belongs to the Qumair Islands; the latter, according to his statement, belong to the Diva Islands (Malediva and Laccadiva); further, as assured by the same author, Qumair is not, as believed by the common people, the name of a tree, but of a people whose color is whitish, and who practise the religion of the Hindu (SACHAU, *Alberuni's India*, Vol. I, p. 210). Wāqwāq is here clearly indicated as an island or insular group in the Indian Ocean with a populace of Hindu culture. The phœnix, as shown by the above extract from Damiri, is naturalized by the Arabs in India; and it is difficult to believe that the Adjaib should place the bird on Madagascar, in Indonesia, or in East Africa.

¹ G. WEIL, *Geschichte der Chalifen*, Vol. II, p. 253.

at the end, however, that the animal merely looks like a rat, but in reality is none, and that it occurs in the country of Gūr (east of Herat in Khovaresm).¹ A gloss to the Talmud, which repeatedly alludes to the legends of the salamander, remarks that the animal has the shape of a mouse, and arises when the wood of the myrtle is burnt in a stove during seven consecutive years.² It is the same when other Oriental authors make the salamander an animal resembling a marten, except that it differs from it in color; for the salamander is always red, yellow, or green.³

THE SALAMANDER AND PHŒNIX IN MEDIÆVAL EUROPE.—In the poetry of the European middle ages the salamander appears first of all in the love-songs of the Provençal Troubadours. Pierre de Cols d'Aorlac regards the erotic fire burning in his heart as so pleasing that it is the more desirable to him, the more it burns him, like the salamander, which is happy in fire and blaze.⁴ In the contemporaneous lyrics of Italy we meet the allegories of the salamander and phœnix woven together: the amorous fire (*il foco amoroso*) is likened to that tenanted by the salamander; the poet is consumed by it, but at the same time rejuvenated like the phœnix; or he dies from the effect of the amorous fire like the phœnix, not being endowed with the salamander's property of being able to live in fire; or he rises again to a new life, like the phœnix, and life in fire becomes his second nature, as is the case with the salamander.

¹ F. HOMMEL, *Namen der Säugetiere bei den südsemitischen Völkern*, p. 338; JAYAKAR, *Damiri's Zoological Lexicon*, Vol. II, pt. I, p. 80. In another place Qazwini mentions also the mineral asbestos (G. JACOB, *Waren beim arabisch-nordischen Verkehr*, p. 18).

² L. LEWISOHN, *Zoologie des Talmuds*, p. 228.

³ D'HERBELOT, *Bibliothèque orientale*, Vol. III, p. 192.

⁴ The idea that the salamander is happiest in fire first occurs in Saint Augustin (*De civitate Dei*, XXI). It is notable how the exaggerations grow. Classical authors stated nothing to that effect, but merely that the salamander coming in contact with fire can extinguish it.

Also the German poetry of the thirteenth century not infrequently mentions the salamander, and incombustible materials spun from its hair. The latter, for instance, occurs in Wolfram von Eschenbach's *Parsifal*. The earliest mediæval allusion to this pseudo-salamander asbestos seems to be made in a Provençal treatise on birds and animals ("Naturas d'alcius auzels e d'alunas bestias"), where it is said, "The salamander subsists on pure fire, and from its skin is made a cloth which fire cannot burn."¹ Again the salamander, through the metamorphosis of the phoenix, appears as a bird. Richard de Fournival, who died about 1260, regards the salamander as a white bird subsisting on fire, and from whose plumage are made cloths that can be purified only by fire.² According to the Old-French romance of *Bauduin de Sebourc*, the salamander lives in the terrestrial paradise as a bird with white woolly down made into tissues; and in *Partonopeus de Blois* a nuptial coat is lined with salamander's down.³ ALBERTUS MAGNUS (circa 1193—1280)⁴ seems to be the only mediæval author who knew that salamander's plume was asbestos.⁵ KONRAD VON MEGENBERG (1309—74), who in his *Book of Nature* devoted a chapter to the salamander,⁶ tells that Pope Alexander possessed a garment of salamander-wool which was washed in fire instead of water.

¹ Salamandra vieu de pur foc, e de son pel fa hom un drap que foc nol pot cremar. Compare F. LAUCHERT, *Geschichte des Physiologus*, pp. 186, 188, 189, 202.

² HIPPEAU, *Bestiaire d'amour*, p. 20 (Paris, 1860).

³ W. HERTZ, *Sage vom Giftmädchen*, p. 66 (*Abh. bayer. Akad.*, Vol. XX, 1893). He refers also to the Byzantine poet Manuel Philos (thirteenth century), who, in his didactic poem on the Properties of Animals, classifies the salamander among the birds.

⁴ *De secretis mulierum item de virtutibus herbarum lapidum et animalium*, p. 134 (Amstelodami, 1669).

⁵ Si vis ignem perpetuum inextinguibilem facere. Accipe lapidem qui Abaston dicitur, et est coloris ferrei et quam plurimum in Arabia reperitur. Si enim lapis ille accendatur nunquam poterit extingui, eo quod habet naturam lanuginis, quae pluma salamandris vocatur, cum modico humidi unctuosi pinguis, inseparabilis est ab ipso, et id fovet ignem accensum in eo.—Albertus' form *abaston* may be compared with the Middle-English forms *asbeston*, *abeston*, *abiston*, *albeston*.

⁶ Ed. of F. PFEIFFER, pp. 276—279.

F. LAUCHERT¹ has shown that the mediæval notions of salamander and phœnix are traceable to the Greek Physiologus;² but he omitted to point out that the conception of the salamander-asbestos is novel, and peculiar to mediæval times. YULE³ admits that he cannot tell when the fable arose that asbestos was a substance derived from the salamander. Certain it is, that it did not exist among the classical peoples; certain it is, also, that the early mediæval writers, with the exception of Albertus Magnus, were not aware of the fact that the alleged product of the salamander was nothing but asbestos, and that asbestos as a mineral was unknown to them,⁴ while it was known to the Arabs. There can be no doubt that the Arabs (say, roughly, in the tenth and eleventh centuries) spread the legend to Europe⁵ by way of Byzance and Spain. The lacune indicated by Yule remains, and it will be seen in the further discussion that this gap in our knowledge is aptly filled by the records of the Chinese.

Marco Polo, with his keen power of observation and his large share of common sense, was the first to shatter the European superstition. It is interesting that he uses the word "salamander" in the sense of asbestos.

"In a mountain of the province of Chingintalas there is a vein of the substance from which salamander is made. For the real truth is that the salamander is no beast, as they allege in our part

¹ *Geschichte des Physiologus*, l. c.

² Plinian influence is visible in the venomous properties of the "snake salamander, which, when touching even the foot of a tree, poisons all its branches" (LAUCHERT, p. 194; PLINY, XXIX, 23).

³ In his edition of *Marco Polo*, Vol. I, p. 216.

⁴ MEGENBERG (*l. c.*, p. 484) noted asbestos after Isidorus, but did not see its identity with salamander-wool.

⁵ It is interesting to note that our own historians of the middle ages did not always grasp the facts in the case; while our Orientalists, owing to the knowledge of Arabic sources, were able to unravel the mystery. Thus A. SCHULTZ (*Das höfische Leben zur Zeit der Minnesänger*, Vol. I, p. 338) mentions without explanation "the textures produced from salamanders and burnt by no fire;" and G. JACOB (*Waren beim arabisch-nordischen Verkehr im Mittelalter*, p. 18), with reference to Qazwini, lays bare the fact.

of the world, but is a substance found in the earth; and I will tell you about it.

"Everybody must be aware that it can be no animal's nature to live in fire, seeing that every animal is composed of all the four elements. Now I, Marco Polo, had a Turkish acquaintance of the name of Zurficar, and he was a very clever fellow. And this Turk related to Messer Marco Polo how he had lived three years in that region on behalf of the Great Kaan, in order to procure those Salamanders for him. He said that the way they got them was by digging in that mountain till they found a certain vein. The substance of this vein was then taken and crushed, and when so treated it divides as it were into fibres of wool, which they set forth to dry. When dry, these fibres were pounded in a great copper mortar, and then washed, so as to remove all the earth and to leave only the fibres like fibres of wool. These were then spun, and made into napkins. When first made these napkins are not very white, but by putting them into the fire for a while they come out as white as snow. And so again whenever they become dirty they are bleached by being put in the fire.

"Now this, and nought else, is the truth about the Salamander, and the people of the country all say the same. Any other account of the matter is fabulous nonsense. And I may add that they have at Rome a napkin of this stuff, which the Grand Kaan sent to the Pope to make a wrapper for the Holy Sudarium of Jesus Christ." ¹

This sober account based on information received in China has left a lasting impression upon European science, and has taught how to discriminate between asbestos as a mineral and the salamander as an animal. A. BOETIUS DE BOOT ² rejected Polo's designation of

¹ Ed. of YULE and CORDIER, Vol. I, p. 213. It will be seen farther on that Marco Polo's account is confirmed by the contemporaneous Annals of the Yüan Dynasty.

² *Gemmarum et lapidum historia*, p. 383 (Lugduni Batavorum, 1636).

the mineral as salamander, restoring the ancient names "amiantus" and "asbestinus," and ridiculed the belief in any animal living in fire. Relying on Marco Polo, A. KIRCHER¹ has fully discussed the subject from a scientific point of view; and his contemporary, the zoölogist JOHN RAY,² was able to state, "Quod Salamandra sine ullo incommodo in igne vivere possit a vulgo creditum, verum a doctioribus dudum abunde refutatum est."

ASBESTOS IN THE NEAR EAST.—Asbestos was well known to the Arabs and Persians, and was much employed by them.³ A number of valuable notes concerning this matter we owe to the erudition of E. WIEDEMANN.⁴ Evliya Effenda narrates that the wonderful carpet presented by Khosru I Nürshirvân to the monastery which he built near Ütch Kilise was made of asbestos, and that asbestos textiles were manufactured on Cyprus.⁵ The Arabic soldiers who hurled naphtha at beleaguered towns were equipped with asbestos garments in order to guard them from accidents which might have happened from handling this inflammable substance.⁶ Dimashqi, Abul Fēdā (1273—1331), and Yaqūt (1179—1229) point to Badakshan

¹ *Lu Chine illustrée*, pp. 278—280 (Amsterdam, 1670). Kircher says that he could receive no information as to the stuff sent by the Great Khan to the Pope (see also CORDIER's note in Yule's *Marco Polo*, Vol. I, p. 216; and compare the above quotation from K. von Megenberg).

² JOANNES RAIUS, *Synopsis animalium quadrupedum*, p. 273 (Londini, 1693).

³ A Syriac allusion occurs in the *Historia Monastica* of the Bishop of Margū (A.D. 840): "Prayer made the martyrs like asbestos before the fire" (E. A. W. BUDGE, *The Book of Governors*, Vol. II, p. 499).

⁴ *Zur Mechanik und Technik bei den Arabern* (SB. P. M. S. Erg., Vol. 93, 1906, pp. 39, 40).

⁵ The latter notice goes back to Dioscorides (L. LÉCLERC, *Traité des simples*, Vol. II, p. 414).

⁶ The Italian chevalier Aldini, about 1825, conducted a series of experiments in using asbestos garments for the protection of firemen. His idea was revived in Paris, the firemen there having been furnished with such clothes, and after conclusive proof of their practical utility, was followed in London (R. H. JONES, *Asbestos*, pp. 31, 159).

as the place where the mineral was found; the former making special mention of lamp-wicks made from it, into which fire penetrates, while they remain unharmed. Yaqūt has the following report: "In the mines near Badakshan is found the stone *fatīla* (that is, 'stone of the wick'), which resembles papyrus (*bardī*). The people believe that it is the plumage of a bird.¹ It is styled also *al-ṭalq*. It is not consumed by fire. It is placed in oil and kindled with fire, in which case it burns like a lamp-wick.² When the oil burns, the stone remains as before, and none of its properties changes. This always takes place whenever it is dipped in oil and burns. When thrown into a blazing fire, it is not hurt by it. Coarse table-cloths are woven from it. These, being soiled, are put into fire to be purified, and whatever dirt is on them is consumed by the flames. They are cleansed, and come out as pure as though they had never been affected by dirt." The erroneous designation *al-ṭalq* is traceable to Ibn al-Baiṭār (1197—1248), who groups around Dioscorides' notice of asbestos Arabic accounts of the mineral *ṭalq* corresponding to our mica.³

A very interesting description of asbestos is given by Abū Ubaid al-Bekrī (1040—94) of Cordova in Spain, in his *Geography of Northern Africa*, as follows:⁴—

"Among the singular products of the country of the Negroes is noticeable a tree with long and slender stem, called *turzi*. It grows in the sand, and bears a big and swollen fruit containing within it a white wool which is made into stuffs and garments. These stuffs are capable of remaining in a vehement fire forever without

¹ That is, the phoenix. For explanation see above, pp. 318—323.

² Compare the statement of Theophrastus (p. 302).

³ L. LECLERC, *Traité des simples*, Vol. II, pp. 414, 415. Pseudo-Aristotle (RUSKA, *Steinbuch des Aristoteles*, p. 174) also describes mica under the same name.

⁴ MACGUCKIN DE SLANV, *Description de l'Afrique septentrionale par El-Bekri*, p. 336 (Alger, 1913).

being damaged. The jurist Abd al-Melek affirms that the inhabitants of Al-Lames, a town of that region, wear only clothing of this kind. Near the river Derā is found a substance similar to it. This is a sort of stone, called, in the language of the Berber, *tamatghost*. When rubbed between the hands, it softens to such a degree that it assumes the consistency of linen. It serves for the making of cordage and halters, which are absolutely incombustible. A costume was made from this substance for one of the Zenatian princes who ruled at Sidjilmessa. A man of proved veracity told me that a trader had sent for a napkin made from this mineral for Ferdilend, King of Galicia, in Spain (Ferdinand I of Leon). He offered it to the prince, explaining that it had belonged to one of the disciples of Jesus, and that fire could produce no impression upon it. He furnished the proof under the eyes of the King, who, struck by such a marvel, expended all his wealth to purchase this relic. He sent it to the sovereign of Constantinople, that it might be deposited in the principal church, and in return received a royal crown with the authorization to wear it. Several persons tell of having seen in the house of Abul Fadl of Bagdad the fringe of a napkin made of this substance, which, when put into fire, became whiter than previously. In order to clean such a napkin, which had the appearance of linen, it was sufficient to place it on a fire."

The employment of asbestos for the purpose of a *pia fraus* is related also by an Arabic traveller. Abū Dulaf who wrote the diary of his journey to China about 941 tells of an incombustible tree, growing in the territory of the tribe Bajā (east of Transoxania), from the wood of which the natives make idols; Christian travellers are in the habit of taking this wood along, asserting that it comes from the cross of Christ. Again he relates about the tribe Kharlok that their houses are of incombustible wood.¹ Both Marquart and

¹ G. FERRAND, *Relations de voyages arabes, persans et turks rel. à l'Extrême-Orient*,

Ferrand who translated and discussed this text have been unable to cope with this problem. Certainly it is not here the question of a tree, as wrongly supposed by these scholars; still less do we meet here, as suggested by Marquart, the conception that the wood of the cross had miraculously been shooting forth again. What we meet here, in fact is asbestos; and this matter has clearly been expounded as early as 1843 by J. YATES in his classical work *Textrinum Antiquorum: An Account of the Art of Weaving among the Ancients* (pp. 362—365). Yates sets forth that ignorance of the true nature of asbestos caused it to be employed in the dark ages for purposes of superstition and religious fraud, and cites several important documents to this effect. One of these is taken from the *Chronicon Casinense* ("Chronicle of the Abbey of Monte Casino") of Leo Ostiensis who narrates a story that some monks returning from a pilgrimage to Jerusalem brought home a particle of the cloth with which Jesus wiped the feet of his disciples (*particulam lintei, cum quo pedes discipulorum Salvator extersit*); and when the genuineness of this relic was doubted, they put it in fire from which it came forth in its previous shape. Thus the authenticity of the relic was convincingly established. Tilingius, in 1684, directly says that impostors exhibit to simple women-folks the stone amiantus, and frequently sell it as

Vol. I, pp. 210, 215. Ferrand has misunderstood Marquart, for he ascribes to the latter the supposition that the question is here of teak-wood. On the contrary, MARQUART (*Osteurop. und ostasiat. Streifzüge*, p. 76) has decidedly rejected this idea, and strangely enough proposed to regard the incombustible tree as the birch. Why the birch should be called incombustible I am unable to see. Abū Dulaf is not to be taken too seriously in matters of natural history; and his assigning to certain tribes of certain products, as partially seen also by Marquart, is purely arbitrary or fictitious. The list of his stones presents curious reminiscences of the fabulous stones of the Alexander Romance and the Arabic *lapidaires* based thereon. The most striking of these reminiscences is the stone luminous at night and serving as lamp (*Pseudo-Callisthenes*, II, 42). This stone, according to the Arabic scribe, is found in the country of the Kirgiz! For this reason I am inclined to think that also his incombustible tree is a purely literary invention from the same source. The Chinese have several accounts of unconsumable trees, partly leaning toward asbestos (see WYLIE, *l. c.*, p. 148).

the wood from the cross of the Savior; they easily take faith therein, since it is not consumed by fire and is veined in the manner of wood. It is equally manifest that Abū Dulaf's incombustible tree which supplied Christians with sacred souvenirs of the cross was nothing but asbestos, and the report of al-Bekri previously mentioned affords additional evidence to this effect. The alleged products ascribed by Abū Dulaf to Central-Asiatic regions are fancifully construed from the legends told in the Alexander Romance, and there, as mentioned above (p. 308), we encounter also the asbestine wood.

Under the Sung dynasty asbestine stuffs were imported into China by the Arabs over the maritime route; they were seven inches wide, differing in length. In the period Chêng-ho 政和 (1111—18), under the Emperor Hui-tsung, asbestine stuffs of half this width were sent as tribute by the Arabs, and at a later date were followed by dishes and baskets of the same material, which on the whole looked like the cloth then made from the product of the cotton-tree, but somewhat darker and almost black in color. When flung into the fire, they came forth brilliant white.¹ Mosul produced asbestine cloth during the middle ages.²

THE SALAMANDER-ASBESTOS IN CHINA.—After this review of the development of the relevant beliefs in the West, we are prepared to understand the asbestos traditions of the Chinese. In these, three stages of development are clearly set off. The first, already described, ranging approximately from the Han to the third century, I am tempted to term the "historical or classical" set of beliefs,

¹ We shall revert once more to this text, not utilized by Wylie and inserted in the *T'ie wei shan ts'ung t'au* 鐵圍山叢談 (Ch. 5, p. 20; edition of *Chi pu tsu chai ts'ung shu*) of Ta'ni T'iao 蔡條, who lived in the first half of the twelfth century. WYLIE (*Notes*, p. 196) states regarding this author that he treats mostly of events which occurred in his own time, and that the work shows a good deal of research, and may be relied upon as an authority in investigations regarding that period.

² HIRTH and ROCKHILL, *Chau Ju-ssu*, p. 140.

agreeing, as they do, with Greek and Roman lore; the second, from the beginning of the fourth century down to the end of the Sung, denotes the "romantic" period of beliefs, coinciding with those of mediæval Europe and the Arabs; the third, inaugurated by the Yüan or Mongol dynasty, is the "realistic," or, if the word be allowed, "scientific," period, based on the actual discovery of asbestos on Chinese soil. We have to deal here first with the mediæval romanticism inaugurated by the speculations of the adepts of Taoism.

The earliest attempts to explain the origin and composition of asbestos were made by the celebrated alchemist Ko Hung 葛洪 (249—330), in his work *Pao-p'u-tse*.¹ This author reports on three kinds of asbestos (*huo huan pu* 火浣布) as follows: "As regards the first kind of fire-proof cloth, it is said that there is in the ocean a majestic mound² harboring a fire that burns of itself.³ This fire rises in the spring, and becomes extinguished in the autumn. On this island grows a tree, the wood of which is able to resist the action of fire, and is but slightly scorched by it, assuming a yellow color. The inhabitants make fuel of it in the usual way, but this fuel is not transformed into ashes. When their food has been cooked, they extinguish the firewood by means of water. In the same manner it is put to use again and again, and indeed represents an inexhaustible supply. The barbarians gather the flowers

¹ My rendering is based on the text as quoted in the *Wei lio* 緯畧 (Ch. 4, p. 3; ed. of *Shou shan ko ts'ung shu*, Vol. 74). This fundamental source on the subject has been overlooked by Wylie.

² *Su k'iu* 肅邱. I should be inclined to regard this as the proper name of Volcano Island, if this term were traceable in the Liang Annals, which, as will be seen below, contain the source for this account of Ko Hung; but it does not occur there. Again, the notice of the Annals goes back to the lost reports of K'ang T'ai 康泰, on his mission to Fu-nan in the first part of the third century. If K'ang T'ai's report had contained the name *Su k'iu*, we might reasonably conclude that it would have found its way into the Annals; for this reason it may be solely an invention of Ko Hung.

³ That is, an active volcano.

of these trees, and weave cloth from them. This is the first kind of fire-proof cloth. Further, they also peel the bark of these trees, boil it by means of lime, and work it into cloth, which is coarse and does not come up to the quality of the material prepared from the flowers. This is the second kind of fire-proof cloth. Moreover, there are white rodents (*pai shu* 白鼠) covered with hair, each three inches long, and living in hollow trees. They may enter fire without being burnt, and their hair can be woven into cloth, which is the third kind of fire-proof cloth." ¹

The first two sorts of asbestos established by Ko Hung, and alleged to be of vegetal origin, are certainly imaginary; and how this matter came about will be fully discussed hereafter. Here the fact that concerns us is that Ko Hung is the first Chinese writer in whom the idea of the animal origin of asbestos has crystallized. Certainly, his "white rodent" is nothing but the salamander of the Western legend, whose wool furnishes asbestos. At first sight it is striking, of course, that Ko Hung's notice far precedes in time any Western version of the legend; yet this can rationally be explained. Two conjectures which might be made to get easily over this state of affairs would not prove before the facts. We cannot assume that the legend is spontaneously Chinese in origin and migrated from China to Western Asia: in China it has no basic facts, whereas

抱朴子曰。火浣布有三種。其一曰海中肅邱有自生火。春起秋滅。洲上生木。木爲火焚不糜但小(gloss: 一無小字)焦黃。人或得薪俱如常。薪但不成灰。炊熟則以水滅之。使復更用如此不窮。夷人取此木華績以爲布一也。又其木皮赤剝之。以灰煮治以爲布爲不及華俱可火浣二也。又有白鼠毛長三寸居空木中。入火不灼。其毛可績爲布三也 (Wei t'io, Ch. 4, p. 3).

we have traced its logical development in the West from the combination of salamander and asbestos. Nor would it be possible to regard the account of Ko Hung as unauthentic or as an anachronism, as we have a number of texts, ranging from the fourth to the sixth century, all relating to the same legend. The *Wu lu* 吳錄¹ is credited with the statement that in Ji-nan (Tonking) is captured a fire-rodent whose hair is made into cloth, being styled "fire-proof cloth."² According to BRETSCHNEIDER,³ this book was written in the third century, during the period of the Three Kingdoms (221—280); but it is hard to believe that at that early date the legend of the salamander-asbestos was known in China. The localization in Ji-nan, foreign to Ko Hung, also seems somewhat suspicious. We have noticed above (p. 312) that asbestos was known in the China of that period, and that in the coeval Annals a tribute gift of it from the Western Regions (*Si Yü*) is on record for the year 239, no reference, however, being made to the salamander story. The earliest date that we may assume for the coming into existence of the latter on Chinese soil is the end of the third or the beginning of the fourth century.

It is more interesting that Kuo P'ö 郭璞 (276—324), a contemporary of Ko Hung, likewise alludes to the salamander-asbestos; for Kuo P'ö, in his commentary to the *Shan hai king*, is made to say the following, as translated by WYLIE:⁴ "Ten thousand *li* to the east of Fu-nan is the kingdom of Ké-po. More than five thousand *li* farther east is the burning mountain kingdom, where, although there may be long-continued rain on the mountain, the

¹ Records of the Kingdom of Wu, by Chang Pu 張勃 of the third century.

² *Wei li*, Ch. 4, p. 8. WYLIE (*l. c.*, p. 149) quotes this passage from *T'ai p'ing yü lun* (Ch. 820, p. 8), where the locality is defined as Pei-king 北景 in Ji-nan.

³ *Bot. Sin.*, pt. 1, p. 209, No. 1043.

⁴ *L. c.*, p. 146.

fire constantly burns. There is a white rat in the fire, which sometimes comes out to the side of the mountain, in order to seek food, when the people catch it and make cloth from the hair, which is what is now called fire-proof cloth." What Wylie transcribes Ké-po is properly Ch'i-po 耆薄; and this is nothing but a variant for the well-known Shé-p'ó 閩婆, the old Chinese designation for the island of Java. The fact that in this connection the question really is of Java becomes evident from other parallel texts alluding to the same matter.¹ The name "Shé-p'ó" for Java, however, does not appear in Chinese records earlier than the first half of the fifth century, the first embassy coming from there being listed in the year 433: consequently Kuo P'ó of the Tsin dynasty cannot have possessed any knowledge of Shé-p'ó, which name must be a later interpolation in his text. Aside from this point, however, the story is entirely creditable to him, because the geographical portion of it, as will be seen, is based on the narrative of K'ang T'ai of the third century, and is even more exactly reproduced by him than by Ko Hung. Kuo P'ó, however, shuns the account of vegetable asbestos, as related by K'ang T'ai and repeated after him by Ko Hung, and focusses the notion of asbestos exclusively on the white rodent (that is, the salamander) inhabiting an active volcano. K'ang T'ai knew nothing at all about this animal. Ko Hung does not naturalize it anywhere. It is Kuo P'ó who took up this legend and placed its home on the Volcano Island first reported by K'ang T'ai: consequently Kuo P'ó's story is a compromise reached between the salamander story coming from the West and the tree-asbestos story of Fu-nan, but it is valueless for tracing the region from which the salamander legend hailed. It did not hail from Volcano

¹ Compare PELLIOT, *Bull. de l'Ecole française*, Vol. III, p. 264; Vol IV, p. 270; these texts will be discussed farther on.

Island in the Malay Archipelago, as K'ang T'ai located there only the alleged tree-asbestos, which in fact is bark-cloth, that has nothing to do with mineral asbestos. K'uo P'ò, further, shows his familiarity with the salamander in his edition of the dictionary *Erh ya*.¹ This enumerates ten kinds of tortoise, the tenth of which is termed "fire tortoise" (*huo kuei* 火龜); and K'uo P'ò annotates that it is like the "fire rodent" (*huo shu*).² The latter animal is not included among those enumerated in the text of the *Erh ya*; that is to say, it is entirely foreign to the ideas of ancient national Chinese culture, but is a borrowed type, which first dawned upon the horizon of the Chinese in the very age of K'uo P'ò himself.

Another contemporaneous allusion to the same matter is found in the *Ku kin chu* 古今注, written toward the middle of the fourth century by Ts'uei Pao 崔豹, who says that the fire-rodent remains immune when going into fire, and that what is termed "fire-proof cloth" is made from the animal's hair, which is ten feet long.³ Ts'uei Pao, in his succinct and sober statement, thoroughly agrees with Ko Hung, differing from him only in somewhat exaggerating the length of the hair. Yet the same author, in the same work, presents a more fantastic account of the matter, which he traces to the *Book of Marvels*⁴ ascribed to the Taoist adept Tung-fang So (born in 160 B.C.). This attribution, as is well known, certainly is fictitious; and the following text bears out this fact again, because it is based on the account of K'ang T'ai, and must therefore be later than the third century. Tung-fang So, according

¹ Ch. 2, p. 10 b.

² This name has been adopted by the Polyglot Dictionary of K'ien-lung (Ch. 81, p. 24) with the literal renderings into Manchu *tuwai singgeri*, Tibetan *me byi*, and Mongol *galxi khulugana*. The explanations given in the Manchu dictionaries show that the salamander-asbestos is understood (see SACHAROV, *Manchu-Russian Dictionary*, p. 765).

³ *P'ei wén yün fu*, Ch. 36, p. 59.

⁴ Entitled by him *Shen i chuan* 神異傳, otherwise *Shen i king* 神異經.

to Ts'uei Pao, is made to say,¹ "In the southern regions there is a volcano forty *li* in length, and from four to five *li* in width. In the midst of this volcanic fire grow trees unconsumable by fire, and day and night exposed to a scorching heat, over which neither wind nor rain has any power. In the fire lives also a rodent, a hundred catties in weight, and covered with hair over two feet in length, as fine as silk, and white in color.² Sometimes it comes out; and by sprinkling water over it, it is put to death. Its hair is then removed and woven into cloth, which is known under the name 'fire-proof cloth.'" Another text, likewise wrongly connected with the name of Tung-fang So, expatiates on the animal with still greater vagaries of fancy, and will be discussed below. We notice that in this Taoist narrative the salamander is made a denizen of Volcano Island, in the same manner as by Kuo P'ao. We accordingly have two versions of the legend current during the fourth century,—a simple and sober one, accounting for the origin of asbestos from an animal identical with the Western salamander; and an elaborate and fantastic one, aggrandized by Taoist lore under the influence of K'ang T'ai's report of a Volcano Island in the Malay Archipelago.

The salamander turns up again in that interesting book *Liang se kung tse ki*, relating to the beginning of the sixth century, and written by Chang Yüe (667—730),³ "Merchants from the Southern

¹ *Pien tse lei pien*, Ch. 21, p. 6. The text is quoted also in the commentary to *San kuo chi*, *Wei chi* (Ch. 4, p. 1 b), in the *Wei lio* (Ch. 4, p. 3), and in the *Ts'i tung ye yü* by Chou Mi.

² It must certainly be white, because asbestos coming out of a fire has this color. WYLIE (*l. c.*, p. 145), who translates from a modern edition of *S'hen i king*, has the addition, "It ordinarily lives in the fire, and is of a deep-red color; but sometimes it comes out, and its hair is then white."

³ See this volume, p. 198. The text in question is preserved in the *Wei lio* 緯畧, Ch. 4, p. 3 b; and in the *Ko chi king yüan*, Ch. 27, p. 13. WYLIE (*l. c.*, p. 143) seems to have translated from another book. His addition, "which the emperor had deposited among the miscellaneous cloths," is not in the text before me.

Sea brought as presents three pieces (*tuán*)¹ of fire-proof cloth.² Duke Kie, recognizing it from afar, exclaimed, 'This is fire-proof cloth, indeed: Two pieces are made from twisted bark,³ and one is made from the hair of a rodent.' On making inquiry of the merchants, their statement exactly agreed with that of the duke.⁴ On asking him the difference between the cloth of vegetal and that of animal origin, the duke replied, 'That manufactured from trees is stiff, that from rodents' hair is pliable; this is the point by which to discriminate between them. Take a burning-mirror and ignite the *tsé* trees⁵ on the northern side of a hill, and the bark of the trees will soon become changed.' The experiment was made, and it turned out in accordance with his affirmation."⁶ The witty duke, accordingly, exploded the old tale of K'ang T'ai, that bark cloth was incombustible and a sort of asbestos. He himself, on former occasions, had doubtless applied the experiment which he recommended in the course of the story, and was possessed of that truly scientific

¹ A cloth measure of 18 feet.

² According to the text of the *Wei lio*, "Duke Kie, passing a market, noticed traders offering three *tuán* of fire-proof cloth" (杰公至市見商人齋火浣三端).

³ It is notable that he speaks of twisted, not of woven bark, as K'ang T'ai and his followers did (see p. 347).

⁴ This sentence is omitted in the text of the *Wei lio*.

⁵ 柘木 *Cudrania tribola*, Hance. Wylie takes this for 斫, or he may have found this reading in his text; for he translates, "Take some wood cut down on the north side of the hill and set a light to it by means of a solar speculum." Duke Kie, of course, did not mean to say this. He wanted to prove by experiment that tree-bark is not incombustible, like asbestos; and with this end in view, it was not necessary to chop the trees.

· 南海商人齋火浣布三端。杰公遙識曰。此火浣布也。二是緝木皮所作。一是績鼠皮所作。以詰商人具如杰公之說。因問木鼠之異。公曰。木堅毛柔是可別也。以陽燧火山陰柘木蕪之木皮改。常試之果驗 (*Ko chi king yüan*, Ch. 27, p. 13).

spirit which does not halt at received traditions, but tries by experiment to get at the root of things. To him true asbestos was only the kind attributed to the salamander,¹ and the duke's wisdom demonstrates that the rodents' hair of the Chinese was really mineral asbestos.

The texts thus arrayed bear out sufficiently the fact that the legend of the salamander-asbestos was popularly current in China from the fourth to the sixth century; and the records of the Chinese very aptly fill the gap which, as we noticed (p. 325), exists in the West between the close of classical antiquity and the traditions of the Arabs and mediæval Europe. The Chinese texts are all prior to those of the Arabs, and it is therefore necessary to conclude that the Chinese and the Arabs must have borrowed the legend from a common source extant in Western Asia at least during the third century. This source is as yet unknown to us, but the conviction of its existence is a postulate without which we cannot intelligently understand the case. There are also indications in Western sources which allow the inference that this prototype resulting in the Chinese and Arabic notions must have lingered in the anterior Orient in the beginning of our era. We have referred to the probable Oriental origin of the salamander legend, and to Pliny's association of it with the Persian Magi; we have pointed out also that it was current in Egypt during the first century A.D., and that Pliny's and Aelian's stories are dependent on the Alexandrian Physiologus. There is accordingly good reason to believe that the

¹ This is confirmed by another passage in the same work *Liang se kung tse ki*, in which Volcano Island (火洲) is mentioned. Here it is said that from the bark of the fiery tree growing there only cloth is made, while fire-proof cloth is produced from the hair of the fire-rodent living on a blazing mound. This text will be found in *T's shu tai ch'êng, Pien i tien* 41, Woman Kingdom (*Nü kwo*), *Kwi k'ao*, p. 2. It is said to have been translated in its entirety by D'HERVEY-ST.-DENTS in his *Mémoire sur le Fou-sang*, which unfortunately is not accessible to me.

salamander legend was known in the Orient on a line stretching from Egypt to Persia, and that the numerous translations of the *Physiologus*, if nothing else, supported its wide diffusion. At the same time, however, as we know from the Chinese records, asbestos-cloth was in evidence in western Asia, and was traded from there over the routes of Central Asia to China. Salamander and asbestos being familiar to the nations of the Roman Orient, they were in possession of the elements with which to form that legend which proceeded from them to China and at a later date loomed up among the Arabs. It may be supposed that this primeval version, as yet unknown, will turn up some day in an early Syriac source (or possibly in a Greek papyrus): and if a Syriac work should tell us of an asbestos-tree, and immediately join to this a notice of the salamander,¹ we may imagine that the temptation was strong to link those two accounts together.

The germ of this lost Oriental version possibly is traceable to a Greek text, from which it can be shown how the identification of asbestos with the salamander may have been effected. Antigonus of Carystus, who was born between 295 B.C. and 290 B.C., and lived at Athens and Pergamum,² has left a small collection of "Wonderful Stories," among which is the following:³ "There are worm-shaped hairy creatures living in the snow. In Cyprus, where copper-ore is smelted, an animal is engendered a little larger than a fly. The same occurs also in the smelting-furnaces of Carystus. Part of them die when separated from the snow; others, when separated from the fire. The salamander, however, quenches the fire." This text is based on that of Aristotle, given above (p. 314), where

¹ See above, p. 308.

² Compare U. VON WILAMOWITZ-MÖLLENDORFF, *Ueber Antigonos von Karystos*.

³ *Historiae mirabiles*, 90, 91 (*Rerum naturalium scriptores Graeci minores*, ed. KELLER, Vol. I, p. 22).

are also mentioned worms found in long-lying snow.¹ Antigonus, however, has here an essential addition, not met with in Aristotle or any other author; and this is that this fire animal occurs also in the furnaces of Carystus.² Now, we have seen that, according to Apollonius and Strabo, Carystus on Euboea was one of the principal asbestos-producing regions, and that from this locality the mineral was even named Carystius. Antigonus hailed from Carystus, and this fact may entitle us to the opinion that he was acquainted with the asbestos mined near his home town. True it is, he does not mention asbestos in the few fragments of his writings which are preserved; and there is nothing to indicate that in the above passage he means to include asbestos in the "smelting-furnaces of Carystus." The point which I wish to make, however, is that it was easy to read this interpretation into his text. An Oriental Greek, Syrian, or Arab, for instance, who knew that "Carystius" was a synonyme for "asbestos," could well have been reminded thereof while reading this passage, and the immediate mention of the salamander might then have led him to link the two notions together.³ In this manner we gain a satisfactory clew as to the probable origin of the salamander-asbestos assimilation, which certainly must have been brought about on the soil of Hellenism,

¹ Aristotle does not name the animal living in fire, but, judging from his description, it appears to be an insect. PLINY (XI, 36, § 119), who speaks of the same creature after Aristotle, calls it *pyralis* or *pyrotocon* (others read *pyrausta*), and describes it as a winged quadruped (*pinnatum quadrupes*) of the size of a larger fly. AELIAN (*Hist. anim.*, II, 2) styles it *pyrigois* ("fire-born").

² Pliny, in harmony with Aristotle, places it only on Cyprus (*in Cyprî acariis fornacibus*), while Aelian gives no locality.

³ It is possible also that the *μυῖον* of the Greek text (from *μύια*, "fly") led to a confusion with *μῦς* ("mouse"), and gave rise to the conception of the salamander as a rat (Qazwîni), mouse (Talmud), or rodent (Chinese). On the other hand, it must be admitted that this metamorphosis is capable also of a logical explanation: the salamander-lizard is smooth and hairless; when the salamander was made to yield asbestos, it naturally had to be transformed into an animal with hair-growth.

during the second or in the beginning of the third century A.D.

Besides the salamander of the character of a rodent, we receive another intimation as to the nature of this animal, which answers the classical notions. A work *Sung chi* 宋志 ("Memoirs of the Sung Period"), by Shên Yo 沈約,¹ contains the following notice: "Blazing Island (Yen chou 炎洲) is situated in the southern ocean, and harbors the animal *ki* (or *kie*)-*ku* 狷狷. When it is caught by people, it cannot be wounded by chopping or piercing. They gather fuel, build a fire, bind the animal and throw it into the fire, and yet it will remain unscorched."²

The name for this animal, which is clearly differentiated from the rodent that follows, seems to be connected with some Malayan form underlying our word "gecko," described thus by YULE and BURNELL:³ "A kind of house-lizard. The word is not now in Anglo-Indian use; it is a naturalist's word; and also is French. It was no doubt originally an onomatopœia from the creature's reiterated utterance. Marcel Devic says the word is adopted from Malay *gekok* [*gēkoq*]. This we do not find in Crawfurd, who has *tāké*, *tākék*, and *goké*, all evidently attempts to represent the utterance. In Burma, the same, or a kindred lizard, is called *tokté*, in like imitation."⁴

¹ Quoted in *Ye k'o ts'ung shu* 野客叢書 by Wang, Mou 王懋 of the Sung period (*Ko chi king yüan*, Ch. 27, p. 13). Regarding this work see WYLIE, *Notes on Chinese Literature*, p. 161. It was published in 1201.

² Then follows the story of the rodent-salamander mingled with the alleged bark-cloth asbestos: "There is, further, the Volcanic Country, constantly enveloped by fire which is not quenched by rain. In this fire there is a white rodent. When the trees in the forests on this burning island have been wetted by rain, their bark becomes scorched; and when exposed to fire, it becomes white. The islanders gather this bark during several months, and weave it into cloth, which makes fire-proof cloth. Either the bark of the trees or the hair of the rodents may yield it."

³ *Hobson-Jobson*, p. 367.

⁴ "Some of the Borneo reptiles produce singular sounds. The commonest among them is a gecko, the *chichak*, which name imitates perfectly the cry which it produces. A much louder and more characteristic cry is that of *Goniocephalus borneensis*, a large

The characters *ki-ku*, in this case, are chosen by the Chinese author only to imitate the sounds of a word like "gecko." As a rule, the animal *ki-ku* is regarded as a mammal. The word first appears under the T'ang in the *Yu yang tsa tsu*, and is synonymous with *fêng li* 風狸, *fêng mu* 風母 ("wind mother"), or *fêng shêng shou* 風生獸 ("wind-born beast").¹ On the other hand, the Chinese know a saurian, *ko-kiai* 蛤蚧, being a word-formation analogous to the Malayan names of the lizard, and, according to Chinese authors, imitative of the call of the animal.²

It thus appears that the rodent-salamander of the Chinese, after all, was a lizard like the salamander of the ancients; and the lizard character of the animal leaks out in the earliest account of the subject by Ko Hung, when he says that the animal lives in hollow trees; for it is the lizard who has acquired this habit. A. R. WALLACE,³ in describing the lizards of the Aru Islands, observed, "Every shrub and herbaceous plant was alive with them; every rotten trunk or dead branch served as a station for some of these active little insect-hunters."

The fact that it was not the Arabs from whom the Chinese received the salamander-asbestos tale is illustrated, from a negative

lizard which lives on trees and has a high and serrated crest down its back. The Malays call this lizard *kog-go*, an imitation of its call-note, which is frequently repeated" (O. BECCARI, *Wanderings in the Great Forests of Borneo*, p. 35). In the *Encyclopædie van Nederlandsch-Indië* (Vol. IV, p. 400) the word is given as *toke*, which is peculiar to Sundanese; it passed also into the language of the Batak on Sumatra; in Malayan it is *tekek* and *tokek*; in Javanese, *tekek*. Compare Moro *tagatak* or *tukatut*, "lizard" (R. S. PORTER, *Primer of the Moro Dialect*, p. 45). In the same encyclopædia (Vol. I, p. 551) will be found a description of the genus and of the beliefs in its venomous property, which are very similar to those entertained by the ancients in regard to the salamander.

¹ See the texts of *Pên ts'ao kang mu*, Ch. 51 A, p. 20 b; and *Wu li siao shi*, Ch. 10, p. 12.

² *Pên ts'ao kang mu*, Ch. 43, p. 6. The oldest text referring to it is the *Ling piao lu* of the T'ang (compare PRIZMAIER, *Denkwürdigkeiten aus dem Tierreiche Chinas*, *SBZk. Wien*, Vol. 80, 1875, p. 14).

³ *The Malay Archipelago*, p. 331.

viewpoint, by the absence in China of any specific reference to the phoenix, of which the Arabs make a great case (p. 319). Some Chinese works have a general reference to birds, but the coincidence is not perfect. Thus the apocryphal *Sou shên ki* 搜神記¹ has a volcano in the region of the K'un-lun, inhabited by herbs, trees, birds, and mammals, all existing in blazing fire and yielding fire-proof cloth.²

¹ WYLIE, *Notes*, p. 192. The passage is in Ch. 13, p. 3 (of the Wu-ch'ang print).

² A case of a different character may be mentioned in this place, as it reveals a very curious coincidence between a Chinese and an Arabic text. The interesting work *Tu yang tsai pien* 杜陽雜編, written by Su Ngo 蘇鶚 in the latter part of the ninth century, contains the following story (Ch. B, p. 1; edition of *Pai hai*): "During the year of the reign of the Emperor Shun-tsung 順宗 (A.D. 805) the country Kiu-mi 拘弭 [otherwise 拘彌, the territory of Keria; see CHAVANNES, *Documents sur les Tou-kieu occidentaux*, p. 128] sent as tribute a pair of birds insensible of fire (劫火雀 一雄一雌). These birds were uniformly black and of the size of a swallow. Their voice was clear, but did not quite resemble that of ordinary birds. When placed on a fire, the fire was spontaneously extinguished. The Emperor, admiring this wonder, had the birds put in a cage of rock-crystal [rock-crystal being believed to be a transformation of ice and to have a cooling effect], which was hung in the sleeping-apartments of the palace. At night the inmates of the palace tried to set fire to the birds by means of burning wax candles, but entirely failed in damaging their plumage." Abu Ubaid al-Bekri (1040—94) of Cordova (MAC GUCKIN DE SLANE, *Description de l'Afrique septentrionale par El-Bekri*, p. 43) has the following account: "Nous donnons le récit suivant sur l'autorité d'Abou-'l-Fadl Djâfer ibn Yousof, Arabe de la tribu de Kelb, qui avait rempli les fonctions de secrétaire auprès de Mounis, seigneur de l'Ifrikiya: 'Nous assistions à un repas donné par Ibn-Ouanemmou le Sanhadjien, seigneur de la ville de Cabea, quand plusieurs campagnards vinrent lui présenter un oiseau de la taille d'un pigeon, mais d'une couleur et d'une forme très singulières. Ils déclarèrent n'avoir jamais vu un oiseau semblable. Le plumage de cet animal offrait les couleurs les plus belles; son bec était long et rouge. Ibn-Ouanemmou demanda aux Arabes, aux Berbers et aux autres personnes présentes s'ils avaient jamais vu un oiseau de cette espèce, et sur leur réponse qu'ils ne le connaissaient pas même de nom, il donna l'ordre de lui couper les ailes et de le lâcher dans le palais. A l'entrée de la nuit, on plaça dans la salle un brasier-fanal allumé, et voilà que l'oiseau se dirigea vers ce meuble et tâcha d'y monter. Les domestiques eurent beau le repousser, il ne cessa d'y revenir. Ibn-Ouanemmou, en ayant été averti, se leva, ainsi que toute la compagnie, afin d'aller voir ce phénomène. Moi-même, dit Djâfer, j'étais un de ceux qui s'y rendirent. Alors, sur l'ordre d'Ibn-Ouanemmou, on laissa agir l'oiseau, qui monta jusqu'au brasier ardent, et se mit à becqueter ses plumes, ainsi que font tous les oiseaux quand ils se chauffent au soleil. On jeta alors dans le brasier des chiffons imprégnés de goudron et une quantité d'autres

While the Chinese, in a somewhat masqueraded form, received the legend of the salamander, they never adopted this word, as did the Arabs and Persians. It was reserved for the Jesuit Father Ferdinand Verbiest (1623—88) to introduce the Chinese, in his *Kun yü t'ü shuo*, to an illustration of a European salamander under the title *sa-la-man-ta-la* 撒辣漫大辣, which he says occurs in the country Germania (*Je-êrh-ma-ni-ya*) in Europe: "Its habitat is in cold and moist places, its temper is very cold, its skin is thick, and its strength is such as to extinguish fire; its hair is of mixed color, black and yellow; a black and spotted crest runs along its back down to its tail." The figure by which his note is illustrated shows a cat or fox-like mammal.¹

THEORY OF THE VEGETAL ORIGIN OF ASBESTOS.—In order to arrive at a correct appreciation of the complex notions developed by Ko Hung and Kuo P'ö regarding asbestos, we shall now turn our attention to another matter. In the first half of the third century A.D., K'ang T'ai 康泰 and Chu Ying 朱應 were engaged in a mission to Fu-nan 扶南 (Cambodja), and on their return to China published two works in which were laid down their experiences during this memorable journey. Their record furnished to the compilers of the Chinese Annals a great deal of information on the ancient history

objets inflammables, afin d'augmenter l'intensité du feu, mais l'animal n'y fit aucune attention et ne se dérangea même pas. Enfin il sauta hors du brasier et se mit à marcher, ne paraissant avoir éprouvé aucun mal.' Quelques habitants de l'Ifrikiya assurent que, dans la ville de Cabes, ils avaient entendu raconter l'histoire de cet oiseau. Dieu seul sait si elle est vraie." In examining each for itself, we should certainly take both the Chinese and the Arabic story for an abstruse fable. Such a fire-proof bird most assuredly does not exist. On either side we are treated to the report of eye-witnesses. The two stories apparently are independent, although the subject is identical. After all, might this mysterious bird be an offshoot of the salamander-phœnix, restored to life by an overstrained imagination?

¹ *T'u shu ts'i ch'êng*, XIX, chapter "Strange Animals," *kuo k'ao* 3, p. 9.

of that country.¹ In the article on Fu-nan, inserted in the Annals of the Liang Dynasty (502—556),² we meet a curious notice on asbestos with reference to a Malayan region, as follows: "It is reported that Fu-nan is bounded on the east by the ocean known as Ta-chang 大漲 ('Great Expanse').³ In this ocean is a great island on which the kingdom of Chu-po 諸薄 (Java) is situated. East from this kingdom is the island of Ma-wu 馬五洲.⁴ Going again over a thousand li in an easterly direction across the Ta-chang Ocean, one reaches Volcano Island.⁵ On this island there

¹ PELLIOT, *Bull. de l'École française*, Vol. III, p. 275.

² *Liang shu*, Ch. 54, p. 3; likewise in *Nan shi*, Ch. 78, p. 3.

³ Corresponding to our Chinese Sea, extending from Hai-nan to the Straits of Malacca.

⁴ PELLIOT (*Bull.*, Vol. IV, p. 270) is inclined to identify this island with Bali by assuming a clerical error ("Ma-li" for "Ma-wu").

⁵ *Tse jan huo chou* 自然火洲 (literally, "the island of fire which burns of itself"). PELLIOT (*Bull.*, Vol. III, p. 265) has justly recognized that the reading "great island" 大洲 in *Liang shu* and *Nan shi* is an error for "fire island." Indeed, the text of *Nan shi* is quoted with the correct reading in the *Wei liao* (Ch. 4, p. 3) of the Sung period, in an essay entitled "Asbestos." WYLIE, in his study *Asbestos in China* (p. 149), not consulted by Pelliot, translated the name by "spontaneous combustion great island." He accordingly accepted the wrong reading, and took the word *jan* in the sense of "to burn." The latter point of view is justified, as, for instance, the *Huan lan* 玄覽 (*Ko chi king yüan*, Ch. 27, p. 13) writes 燃火之洲. Which of the numerous volcanic islands of the Archipelago, one of the chief volcanic belts on the globe, should be understood by K'ang T'ai's "Volcano Island," certainly is difficult to guess. In my opinion, Timor stands a fair chance of claiming this honor. A. R. WALLACE (*The Malay Archipelago*, p. 5) observes, "To the eastward, the long string of islands from Java, passing by the north of Timor and away to Banda, are probably all due to volcanic action. Timor itself consists of ancient stratified rocks, but is said to have one volcano near its centre." Again on p. 7, "In Timor the most common trees are Eucalypti of several species, so characteristic of Australia, with sandal-wood, acacia, and other sorts in less abundance. These are scattered over the country more or less thickly, but never so as to deserve the name of a forest. Coarse and scanty grasses grow beneath them on the more barren hills, and a luxuriant herbage in the moister localities. In the islands between Timor and Java there is often a more thickly wooded country, abounding in thorny and prickly trees. These seldom reach any great height, and during the force of the dry season they almost completely lose their leaves, allowing the ground beneath them to be parched up, and contrasting strongly with the damp gloomy, ever-verdant forests of the other islands. This peculiar character, which extends in a less degree to the southern peninsula of Celebes and the east end of Java, is most probably owing to the proximity of Australia. The

are trees which grow in the fire. The people in the vicinity of the island peel off the bark, and spin and weave it into cloth hardly a few feet in length. This they work into kerchiefs, which do not differ in appearance from textiles made of palm and hemp fibres,¹ and are of a slightly bluish-black color. When these are in the least soiled, they are thrown into fire and thoroughly purified. This substance is made also into lamp-wicks which never become

south-east monsoon, which lasts for about two-thirds of the year (from March to November), blowing over the northern parts of that country, produces a degree of heat and dryness which assimilates the vegetation and physical aspect of the adjacent islands to its own. A little further eastward in Timor-laut and the Ké Islands, a moister climate prevails, the south-east winds blowing from the Pacific through Torres Straits and over the damp forests of New Guinea, and as a consequence every rocky islet is clothed with verdure, to its very summit. Further west again, as the same dry winds blow over a wider and wider extent of ocean, they have time to absorb fresh moisture, and we accordingly find the island of Java possessing a less and less arid climate, till in the extreme west near Batavia rain occurs more or less all the year round, and the mountains are everywhere clothed with forests of unexampled luxuriance." "The land mammals of Timor are only six in number, one of which is a shrew mouse (*Sorex tennis*), supposed to be peculiar to the island" (*ibid.*, p. 160).

¹ *Tsiao ma* 蕉麻. Pelliot renders this by "scorched hemp" (*du chanvre roussi*), as if the reading were 焦. Wylie translates the term "raw hemp;" but the word *tsiao* denotes a particular group of plants, the fibre-furnishing palms, and is co-ordinated with the word *ma* ("hemp"). Clothing of palm-fibres was particularly made by the aboriginal tribes of southern China, and known as *hung tsiao pu* 紅蕉布 (*hung tsiao* being a variety of the genus *Musa*; see the *Ck'i yu* 赤雅 by Kuang Lu, Ch. A, p. 5, ed. of *Chi pu tsu chai ts'ung shu*). The so-called Manila hemp of commerce is obtained from the Abaca (*Musa textilis*), the staple material for Filipino weavings (see C. R. DONNE, *Descriptive Catalogue of Useful Fibre Plants of the World*, pp. 248—249, Washington, 1897; and the recent interesting article of C. ELATA, *Philippine Fiber Plants*, in the *Philippine Craftsman*, Manila, 1914, pp. 442—456). MARCO POLO (ed. of YULE and COEDREU, Vol. II, p. 124) mentions that the people of the province of Kusi-chou manufacture stuffs of the bark of certain trees which form very fine summer clothing. I do not believe with Yule (p. 127) that Polo here refers to the so-called grass-cloth, but he indeed means literally cloth woven from the bark-fibres of trees. The Miao in the prefecture of Li-p'ing, province of Kusi-chou, indeed make textiles from tree-bark, called bark-cloth (*p'i pu* 皮布; see *Tu Ts'ing i t'ung chi*, Ch. 400, p. 4). According to Megasthenes (STRABO, xv, 60) the Sarmanes (Sanskrit *śramana*, "ascetic") of India used to wear garments made from the bark of trees. The various kinds of hemp grown in China are briefly enumerated in *Chinese Jute*, published by Order of the Inspector General of Customs (Shanghai, 1891).

exhausted." This text presents a somewhat amazing effort at associating heterogeneous ideas. The real affair described is the well-known bast-cloth, common to the Malayan and Polynesian tribes, and peculiar to many other culture-areas, which assuredly is not incombustible; and this product is passed off as asbestos. The reference to the purification in fire and to the making of wicks doubtless proves that asbestos is intended. On the other hand, the resemblance of asbestos-fibres to hemp or flax is well-known.¹

The term "bark-cloth" is equivocal: it denotes principally two types,—one known under the Polynesian name *tapa*, in which the bast is flayed and pounded or macerated in water till it becomes soft and pliable;² and another, in which the bast-fibre shreds into filaments that may be spun and woven. As K'ang T'ai refers to the latter process, he must have had textiles of bast-fibre in mind. Ko Hung, as already stated, based his account of asbestos on K'ang T'ai's report, and was familiar with both beaten and woven bark-cloth; for he has established two vegetable varieties of asbestos,—one woven from the flowers of trees, the other prepared from bark.

¹ Hence our name "earth-flax" (Dutch *steen vlas*, that is, "stone flax;" German *Flachsstein*).

² This method is practised not only by the Malayo-Polynesian stock, but also by the negroes of Africa and the aboriginal tribes of America. Only a few instances from literature may be given, whose number might certainly be augmented by many others. W. MARSDEN (*History of Sumatra*, p. 49, London, 1811) says on this subject, "The original clothing of the Sumatrans is the same with that found by navigators among the inhabitants of the South Sea Islands, and now generally called by the name of Otaheitean cloth. It is still used among the Rejangs for their working dress, and I have one in my possession, procured from these people, consisting of a jacket, short drawers, and a cap for the head. This is the inner bark of a certain species of tree, beaten out to the degree of fineness required; approaching the more to perfection, as it resembles the softer kind of leather, some being nearly equal to the most delicate kid skin; in which character it somewhat differs from the South Sea cloth, as that bears a resemblance rather to paper, or to the manufacture of the loom." In central Celebes the art of weaving is still unknown, and the tribes use only beaten bark cloth derived from a large variety of trees (P. and F. SARASIN, *Reisen auf Celebes*, Vol. I, p. 259, where the process is described). See also DODGE, *l. c.*, pp. 98—101.

Is K'ang T'ai himself responsible for this fanciful combination, or did he merely reproduce a tradition overheard by him in Fu-nan? We know that K'ang T'ai, during his residence in that country in the first part of the third century, encountered a Hindu named Ch'ên-sung 陳宋, who had been despatched there by the King of Central India in response to the mission intrusted to Su-wu 蘇物 by Fan Chan 范旃, King of Fu-nan. Thus K'ang T'ai availed himself of the opportunity of interviewing Ch'ên-sung on all matters concerning India, and on his return to China published a work on the hundred and odd kingdoms of which he had heard. This valuable source of information has unfortunately perished.¹ India and Fu-nan entertained close commercial relations: diamonds, sandal-wood, and saffron being expressly mentioned in the T'ang Annals as products that were exchanged by India with Ta Ts'in, Fu-nan, and Kiao-chi (Tonking).² True it is, asbestos is not specified in the list of these products; but K'ang T'ai's story allows us a peep behind the scenes, for it incontrovertibly shows that asbestos was known in Fu-nan during the time of his sojourn. Certainly it could not have come from any Malayan region, where asbestos, as far as I know, is not found or utilized by the native population: it evidently arrived in Fu-nan from India. In A.D. 380 India presented to the Court of China an offering of fire-proof cloth;³ and this same event is alluded to in the Annals of the Tsin Dynasty, in the life of Fu Kieu 苻健 (337—384),⁴ in the statement that India offered fire-proof cloth.⁵ We remember that Pliny naturalizes asbestos in India, that Hierocles equips the Indian Brahmins with

¹ PELLIOU, *Bull.*, Vol. III, p. 276.

² *T'ang shu*, Ch. 221 A, p. 10.

³ *Shi len kuo ch'un ts'in*, Ch. 37, p. 11 (compare WYLIE, *l. c.*, p. 143).

⁴ GILES, *Biographical Dictionary*, p. 230.

⁵ *Tsin shu*, Ch. 112 (compare *Pien tso lei pien*, Ch. 21, p. 6).

asbestos garments, and that the Arabs derived the mineral from Badakshan (pp. 320, 327): hence we are entitled to presume that asbestos was sometimes shipped also from India to Fu-nan in the beginning of the third century. This postulate is necessary to account for the fact that K'ang T'ai struck correct notions in Fu-nan regarding asbestos,—notions which agree with those of the classical authors. Asbestos products, however, were rare in Fu-nan, as in Hellas and Rome (PLINY, *rarum inventu*) and everywhere else, and the supply presumably could not keep pace with the demand; therefore the "malign and astute" people of Fu-nan¹ conceived the ruse to trade off Malayan bast-cloth under the name of "asbestos." This at least seems to me the best possible theory explaining K'ang T'ai's account, as far as the theory of vegetal origin is concerned. A specific example of what the Fu-nan asbestos was is offered by the interesting story of Duke Kie, discussed above, from which it appears that bast-cloth was really shipped to China under the label "asbestos." The merchants who offered this ware hailed from the Southern Sea, and this product must have been identical with what was shown K'ang T'ai on his visit in Fu-nan. Duke Kie's clever experiment also demonstrates that K'ang T'ai had merely fallen victim to a mystification.

The influence of the asbestos text in the Liang Annals is apparent not only in the Taoist school of the fourth century, as shown above, but also in several later works. Thus the *Hüan lan* or *Yüan lan* 玄(元)覽, a work of the T'ang period (618—906),² says, "In P'i-k'ien 毘騫 there is the Island of Blazing Fire, producing a tree the substance of which can be woven, and which furnishes what is called fire-proof cloth." The geographical term "P'i-k'ien"

¹ Thus they are characterized in the Annals of the Southern Ts'i (PELLIOT, *Bull.*, Vol. III, p. 261).

² Cited in *Ko chi king yüan*, Ch. 27, p. 13.

occurs in the Fu-nan account of the Liang Annals as the name of a great island of the ocean, situated 8000 *li* from Fu-nan, and, according to PÉLLIOT,¹ seems to have been along the Irrawaddy and the Indian Ocean. The information of the *Hüan lan*, of course, is deficient, as in the Liang Annals Volcano Island has nothing to do with P'í-k'ien, but is located far eastward, in the Malay Archipelago.

In the above translation of the passage of the Liang Annals, the kingdom of Chu-po has been identified with Java, the name being a variant of Shê-p'ò, by which Java became known from the first half of the fifth century. This conclusion is confirmed by a text ascribed to the *I wu chi* 異物志 and contained in the *T'ai p'ing yü lan*,² in which the Island of Blazing Fire is located in the kingdom of Se-tiao 斯調, which is doubtless a misprint for Ye-tiao 葉調. Now, we owe to the ingenuity of PÉLLIOT the identification of this name with the old Sanskrit designation Yavadvīpa,³ and this solution of the problem seems to me a well-assured result. Since the *I wu chi*, in its account of Volcano Island, depends upon the text of the Liang Annals, it seems equally certain that the Chu-po country mentioned in the latter is the island of Java. The passage of the *I wu chi* is worded as follows: "In the kingdom of Ye-tiao (Java) there is the Island of Blazing Fire, covered with a fiery plain, which lights up spontaneously in the spring and summer, and dies away during the autumn and winter. Trees grow there which do not waste, the branches and bark renewing their fresh appearance; in the autumn and winter, however, when the fire dies out, they all wither and droop. It is customary to gather the bark

¹ *Bull.*, Vol. III, p. 264.

² Ch. 820, p. 9 (edition of Juan Yüan, 1813). The text is quoted also in the commentary to *San kuo chi*, *Wei chi*, Ch. 4, p. 1.

³ *Bull.*, Vol. IV, p. 268; and *T'oung Pao*, 1912, p. 457.

in the winter for the purpose of making cloth. It is of a slightly bluish-black color. When it is soiled, it is thrown into fire again, and comes out fresh and bright." ¹ The interesting point here is that the trees alleged to yield asbestos are set in causal relation with the fire of the volcano, which transmits to the bark its fire-proof quality.

Two other texts may likewise be traced to the Fu-nan account in the Liang Annals. The *Hüan chung ki* 玄中記, written by Kuo 郭 ² of the fifth century, observes that "there is a volcano in the south, producing a tree which is used for fuel without being consumed; the bark, when woven, makes fire-proof cloth, of which there are two kinds." ³ The *Shu i ki* 述異記 ("Record of Wonderful Matters"), by Jên Fang 任昉, who lived in the beginning of the sixth century, annotates that "the fire of this active volcano in the south is extinguished in the twelfth month whereupon all trees push forth branches; while, when the fire rises again, the leaves drop, the same as in winter in China, When the wood is used for fuel, it is not consumed by the fire; and the bark, when woven, makes fire-proof cloth." This version must be connected with one handed down in the *Wên hien t'ung k'ao* of Ma Tuan-lin, who erroneously says that the Volcano country (*Huo shan*) became known only at the time of the Sui (589—618), and then quotes the following from the "Customs of Fu-nan" (*Fu-nan t'u su* 扶南土俗), by K'ang T'ai: ⁴ "Volcano Island is situated somewhat over a thousand *li* east of Ma-wu Island. In the spring the rains set in; and when the rainy season is over, the fire of the volcano

¹ Compare WYLIE, *l. c.*, p. 146.

² His personal name is unknown.

³ In agreement with *Pao-p'u-tse* (p. 332).

⁴ Compare PELLIER, *Bull.*, Vol. III, pp. 275 and 276, note 2. My rendering is based on the text in *Yüan kien lei han*, Ch. 233, p. 19.

breaks forth. The trees in the forests of the island, when wetted by the rain, have a black bark, but, when affected by the fire, the bark assumes a white color.¹ The inhabitants of the adjoining isles gather this tree-bark during the spring, and weave it into cloth; they make it also into lamp-wicks. When but a bit soiled, they fling the cloth into fire, and this means purify it. There is, further, a mountain, north of the country Ko-ying (written Kia-ying 加營)² and west of Chu-po (Java), 300 *li* in circumference. The active eruption of fire opens from the fourth month, and ceases in the first month. During the period of volcanic activity the trees drop their leaves, as in China during the cold season. In the third month the people betake themselves to this mountain to peel the tree-bark, which is then woven into fire-proof cloth."

The *Lo-yang kia lan ki* 洛陽伽藍記³ states that the country Kū-se 車斯 produces fire-proof cloth which is made from the bark of trees, and that these trees are not consumed by fire.⁴ The number of texts insisting on the vegetal origin of asbestos could doubtless be much increased; but those here assembled are sufficient to show that this doctrine, first traceable to K'ang T'ai, had obtained a permanent hold on the Chinese mind, despite the contradictory explanation based on the salamander. While the Chinese salamander versions unquestionably go back to Western traditions, I am not convinced that this is the case also with the vegetal theory. As set forth above (p. 306), I do not share the opinion of those who impute to Pliny a belief in a plant origin of asbestos.

¹ This observation, of course, relates in reality to asbestos.

² See PELLIOU, *Bull.*, Vol. IV, p. 278, note.

³ Records of the Buddhist Establishments in the Capital Lo-yang, written by Yang Hsüan-chi 楊銜之 in 547 or shortly afterwards (BRETSCHNEIDER, *Bot. Sin.*, pt. 1, No. 493; and CHAVANNES, *Bull.*, Vol. III, p. 383).

⁴ *Tu shu tsi ch'êng*, chapter on fire (*tsa lu*), p. 11 b. Kū-se is perhaps identical with Kū-shi 車師, designating "Turfan-Doimesa."

The tree-asbestos of the Alexander Romance and a Syriac work (p. 308) represents rather isolated instances which show lack of cohesion, and cannot be unduly emphasized. Asbestos filaments bear such a striking resemblance to hemp or flax fibres, that it becomes intelligible that the theory of their identity could have spontaneously been advanced in various parts of the world. Our own nomenclature of asbestos varieties is witness thereof.¹ In the following section I shall try to explain how this theory originated in Fu-nan.²

The Arabs and mediæval Europe, as already observed, were too much absorbed by the identification of asbestos with the salamander and phœnix to pay much attention to the idea of vegetal provenience. This view, curiously enough, loomed up in Europe in MARTINI'S *Atlas Sinensis*. It is told there that there is a kingdom

¹ The mountain-tree asbestos of the Chinese meets its parallel in our "mountain wood" or ligniform asbestos (*xylotid*),—a variety of asbestos which is hard and close grained, generally of a brownish color, and often bearing an exact resemblance to petrified wood. At first sight it might easily be mistaken for the latter, especially when sufficient iron is present to give it the ruddy tinge of decayed wood or bark. Under the microscope, however, the crystal fibre is easily detected, as is also the absence of the vegetable cells which are always to be found in petrified wood (R. H. JONES, *Asbestos*, p. 14). Also the Chinese seem to have taken petrified wood for asbestos (see WYLIE, *l. c.*, p. 152; and the writer's *Notes on Turquois*, p. 24).

² An analogous example in which the ancients were deluded in regard to a Chinese product, is presented by Chinese silk taken by several classical authors for thin fleeces obtained from trees (YATES, *Textinum Antiquorum*, p. 182). VIRGIL (*Georgica*, II, 121) has the verse, "And Seres comb their fleece from silken leaves" (*Velleraque ut foliis depectant tenuia Seres*). STRABO (XV, 20) supposed the raw silk material to be a sort of byssos fibres scraped from the bark of trees. According to DIONYSIUS PERIEGETES, the Seres comb the variously colored flowers of the desert land to make precious figured garments, resembling in color the flowers of the meadow (*ibid.*, p. 181). PLINY (VI, 20) speaks of the Seres famed for the wool found in their forests; they comb off a white down adhering to the leaves, and steep it in water. The use of water to detach silk from the trees is insisted on also by Solinus and Ammianus Marcellinus, both of whom propound the vegetal theory of the origin of silk. Pausanias of the second century denied that the threads from which the Seres make webs are the produce of bark, and described the silkworm with fair correctness.

in Tartary styled Taniu, which produces stones; and above these, an herb which fire can never consume. When it is surrounded by flames, it reddens as though it would be entirely burned up; but as soon as the fire is out, it re-assumes its former gray or ash color. It is never very large or high; but it grows like human hair, and has almost the shape of the latter. Its consistency is very feeble and delicate; and when placed in water, it is noted that it turns into mud and is entirely dissolved. ¹

THE VOLCANIC THEORY.—After having discussed the opinions of the animal and vegetal origin of asbestos, another question remains to be answered,—How did the idea of a volcano acting upon the formation of asbestos spring into existence and develop? Besides the volcanic theory propounded by K'ang T'ai, there are a few others that call for attention. The *Shi i ki* ² records an embassy from the country of the Yü-shan bringing a tribute of fire-proof cloth to the Emperor Wu of the Tsin dynasty in the year 280. On this occasion the envoys of Yü-shan stated that "in their country there is a mountain containing veined stones (*wen shi* 文石) sending forth fire, the appearance of smoke being visible at the horizon throughout the four seasons. 'This fire was known as the 'cleansing fire.' When unclean clothes were thrown on these blazing stones, however big the accumulation of filth, they were purified in this manner, and came out as new." These clothes, of course, must have been of asbestos-fibres. This story is strange, ³ and is hardly reproduced correctly in the Chinese text, as it is now before us. No reason can be discovered why asbestos-cloth should be cleaned in a volcanic

¹ A. KIRCHER, *La Chine illustrée*, p. 278 (Amsterdam, 1670). Kircher refutes this error; Martini's story is doubtless derived from the Chinese.

² Ch. 9, p. 4 (ed. of *Han Wei ts'ung shu*); compare WYLLIE, *l. c.*, p. 143.

³ In all probability it is a mere echo and bad digestion of K'ang T'ai's narrative.

fire, as any other ordinary fire would answer the same purpose. The true story must have been so worded that asbestos itself was produced by the volcano in question, and that the agency of the volcanic fire to which it was exposed was instrumental in rendering it impervious to fire.¹ We have here, then, a reference to an asbestos-producing volcano situated in the west of China. A burning mountain beyond the K'un-lun, upon which any object that is thrown is immediately burnt, is mentioned in the *Shan hai king*;² and we have seen that the *Sou shên ki* derives asbestos from this volcano in the K'un-lun.³ Chinese tradition, accordingly, is acquainted with two volcanoes producing asbestos,—one on an island in the eastern part of the Malay Archipelago, first reported by K'ang T'ai; and another placed in Central Asia. From none of these territories, however, has asbestos ever become known to us: hence we are compelled to conclude that the volcanic theories of the Chinese records have not been prompted by immediate observation, but are the result of a series of speculative thoughts. These thoughts themselves, on the other hand, have a certain foundation in correct observation: it is in the manner of their concatenation that the speculative element comes in.

It may first be noted that from our scientific viewpoint even the direct association of asbestos with volcanoes is quite correct. In the widest sense of the word, we include under "asbestos" both pyroxene and hornblende; the latter most frequently, the former

¹ In a manner similar to that in which Pliny invokes the scorching heat of the tropical sun in the deserts of India as the cause of the fire-proof quality of the mineral.

² WYLIE, *l. c.*, p. 146.

³ The Sung History, according to BRETSCHNEIDER (*Medieval Researches*, Vol. II, p. 190), describes a volcano north of Urumtsi, which contains sal ammoniac: "Inside there is a perpetual fire, and the smoke sent out from it never ceases; clouds or fogs are never seen around this mountain; in the evening the flames issuing from it resemble torch-light; the bats, from this phenomenon, appear also in a red color." Compare W. OUSELEY, *Oriental Geography of Ibn Haukal*, p. 264.

more rarely, assuming an asbestiform character. Pyroxene, a very common mineral, is a constituent in almost all basic eruptive rocks, and is principally confined to crystalline and volcanic rocks. In different localities it is associated with granite, granular limestone, serpentine, greenstone, basalt, or lavas. Likewise hornblende is an essential constituent of igneous rocks.¹ Nevertheless we cannot grant the Chinese the merit of having made such an observation, which is due solely to our modern geological research. There is, moreover, no volcano in Asia which to our knowledge has ever yielded asbestos, nor do the Chinese pretend to have actually imported the material from a volcanic region. To them the volcano is a romantic place of refuge to explain the perplexing properties of asbestos. The introduction of the volcano must not be explained by reading into it the latest achievements of our geology, but from the thoughts evolved by the nature philosophy of the Chinese, nourished by the glowing accounts accruing from foreign countries. The question will be difficult to settle, whether K'ang T'ai owes his theory to himself and his Chinese environment, psychological and educational, or whether he borrowed it outright from the people of Fu-nan. I feel positive of the one fact, that the volcanic point in it was conceived in Fu-nan; for China has no volcanoes, and all Chinese accounts of such relate to countries abroad.²

¹ R. H. JONES, *Asbestos*, p. 21. Asbestos occurs in high altitudes. In Italy, for instance, it is rarely found at a lower level than five thousand feet, ranging from this upwards to twelve thousand; in fact, up to the line of perpetual snow. Hence the addition "mountain" is so prominent in our names for the varieties; as, "mountain wood," "mountain leather," "mountain paper," "mountain cork," "mountain flax."

² There is a negative criterion which illustrates that the Fu-nan tradition of the volcanic asbestos is not due to an impetus from outside. The Arabic authors make frequent allusions to the volcanoes of Java and neighboring islands, but never mention asbestos in this connection. Ibn Khordūbeh, in his *Book of the Routes and Kingdoms* (844—848), tells of a small volcano in Jāba (Java), a hundred cubits square, and only of the height of a lance, on the summit of which flames are visible during the night, while it throws up smoke during the day. The merchant Soleiman, who wrote in 851, speaks of a

To K'ang T'ai, asbestos-fibres were of vegetal origin, the product of the bark of a tree, somewhat on the order of palm or hemp fibre. The ready-made textile was impervious to fire, and the mind eager to account for this wonder of nature settled on the theory that this property should have been brought about through the action of a natural fire. The material in its crude state had already habituated itself to fire, which had hardened it in such a manner that it could successfully resist all attacks of the element,—an idea also alive in Pliny's mind. People of Fu-nan who had occasion to visit certain Malayan islands with their belt of volcanic mountains observed the great luxury of vegetation which there prevailed, and its endurance despite volcanic eruptions. PLINY tells us of an ash-tree overshadowing the fiery spring of a volcano and always remaining green.¹ Chao Ju-kua, describing the action of Mount Etna, observes, "Once in five years fire and stones break out and flow down as far as the shore, and then go back again. The trees in the woods through which this stream flows are not burned, but the stones it meets in its course are turned to ashes."² If there were plants to outlive the ravages of volcanic destruction, the primitive mind argued that the absorption of subterranean fire had made them fire-proof. The fibres of asbestos, being fire-proof, were consequently derived from plants growing on volcanic isles, this association being facili-

Mountain of Fire near Jāwaga (Java) which it is impossible to approach; at its foot there is a spring of cold and sweet water; the same is reiterated by Ibu al-Faḡih (902). Masūdī (943) reports a tradition regarding the Malayan volcanoes, according to which, during the thunder-like eruptions, a strange and terrifying voice resounded announcing the death of the king or chief, the sounds being louder or lower in accordance with the importance of the person (see G. FERRAND, *Relations de voyages arabes, persans et turks rel. à l'Extrême-Orient*, Vol. I, pp. 28, 41, 59, 99, 110, 145; and CABRA DE VAUX, *Maḡoudī, Livre de l'avertissement*, pp. 90—92). Not one of these or any later Arabic writers mentions asbestos among the products of either Java or any other Malayan region.

¹ Viret aeterno hunc fontem igneum contegens fraxinus (II, 107, § 240).

² Translation of HIRTH and ROCKHILL, p. 154.

tated by the fact that their inhabitants manufactured fabrics of bark-fibres. That this hypothesis was formulated in Fu-nan appears plausible to a high degree; for, aside from the inward probability of this supposition, there is no such account in classical antiquity, Western Asia, or India. Pliny neither correlates asbestos with volcanoes, nor does he speak of asbestos in his discourse on the latter.

The report of K'ang T'ai, duly adopted by his countrymen, was then crossed by the salamander story inflowing from the Roman Orient, and the imaginative Taoists at once set to work to reach a compromise between the salamander-asbestos and the volcanic tree-bark asbestos. If the vegetable kingdom in certain places could survive a volcanic fire, and if, as stated by Western traditions, the salamander could exist in fire, there was in all the world no reason why the hardy creature could not stand a volcanic fire as well. This was the act of Kuo P'ò, who ejected the trees and replaced them by the salamander, that now made its home in the blazes of Volcano Island in the Malay Archipelago (p. 335). To the author of the *Sou shên ki*¹ this compromise seemed too radical, and he arbitrated by restoring K'ang T'ai and bringing Kuo P'ò to honor. The vegetable as well as the animal kingdom, in his way of reasoning, can live in volcanic fires; and asbestos is either the product of the bark of these plants, or of the plumage of birds or the hair of beasts. Wang Mou of the Sung period accepted this verdict, and acquiesced in the belief that there is foundation for both these statements.²

DISCOVERY OF ASBESTOS ON CHINESE SOIL.—The Annals of the Later Han Dynasty, in the interesting chapter dealing with the

¹ Ch. 13, p. 3 (of the Wu-ch'ang print).

² WYLIE, *l. c.*, p. 147.

southern Man (*Nan Man*) and the barbarous tribes in the south-west of China (*Si-nan I* 西南夷), have the following report: "Their contributions of tribute-cloth, fire-down (*huo ts'ui* 火毳), parrots, and elephants, were all conveyed to the Treasury."¹ WYLIE² refers this account to the tribe called Jan-mang 冉駹,³ mentioned in this chapter of the *Annals* a couple of pages before; but it would seem that it relates in fact to the Pai-ma-ti 白馬氏,⁴ a tribe settled in Sze-ch'uan Province (north-east of Mao chou).⁵

The term "fire-down," employed in the text of the *Annals*, is explained by the commentary as being identical with the term "fire-proof cloth" (*huo huan pu*); that is to say, it is understood by the Chinese in the sense of asbestos. The word *ts'ui* is very ancient, and appears as early as the time of the *Shi king*⁶ with the significance of clothing woven from the down of birds or the fine undergrowth of hair of mammals.⁷ Such textiles woven from bird's down are ascribed by the Chinese also to the aboriginal tribes inhabiting southern China. E. H. PARKER⁸ has extracted from the *Ling nan i wu chi* the information that the chiefs of southern China select the finest down of the geese and mix it with the

¹ *Hou Han shu*, Ch. 116, p. 11 b.

² *L. c.*, p. 150.

³ He wrongly transcribes the first character *Tan* (compare HIRTH, *China and the Roman Orient*, p. 36). The tribal name *Mang* is doubtless identical with the Mang 莽 studied by G. DELVÉRIA (*Frontière sino-annamite*, p. 159); see also CHAVANNES, *Toung Pao*, 1906, p. 689.

⁴ *Ibid.*, p. 11 a.

⁵ Compare the interesting study of J. H. PLATH, *Fremde barbarische Stämme im alten China*, p. 515 (*SB. bayer. Akad.*, 1874). The Pai-ma-ti seem to have extended from Sze-ch'uan as far as into Kan-su (CHAVANNES, *Toung Pao*, 1905, p. 528).

⁶ LEGGE, *Chinese Classics*, Vol. IV, p. 121.

⁷ It is only the soft down of wild birds and wild beasts. The translation "habillement fait en laine," given by BIOT (*Le Tcheou-li*, Vol. II, p. 6), is erroneous, as already pointed out by J. H. PLATH (*Nahrung, Kleidung und Wohnung der alten Chinesen*, p. 37); also COUVREUR has the wrong rendering, "vêtement de laine."

⁸ *China Review*, Vol. XIX, p. 191.

threads of white cloth to make coverlets, the warmth and softness of which are not inferior to those of soft floss cushions. In other words, Mr. Parker adds, eider-down quilts were known in China very long ago. D. I. MACGOWAN, in his highly interesting essay *Chinese and Aztec Plumagery*,¹ makes this contribution to the subject: "A work styled 'New Conversations on things seen and heard at Canton,' was written by a native of Su-chou who spent many years in that city in a mercantile capacity in the latter part of the last century. In a short section devoted to bird clothes, he says, 'There are several kinds of birds, the feathers of which are woven into a peculiar cloth by the Southern Barbarians. Among them is the celestial goose velvet,² the foundation of the fabric being of silk, into which the feathers were ingeniously and skilfully interwoven, on a common loom, those of a crimson hue being the most expensive. Of these wild goose feathers, two kinds of cloth were made, one for winter, the other for summer wear. Rain could not moisten them; they were called 'rain satin,' and 'rain gauze,' respectively. Canton men imitated the manufacture, employing feathers of the common goose, blending them with cloth. 'This fabric, though inferior in quality, was much cheaper.'" The tribe Nung 儂 in Kuang-si made a special industry of fabricating a tissue of cotton and goose-down.³ Kuang Lu 廓露, who spent several years among the Miao tribes in the service of one of the female chiefs,⁴

¹ *American Journal of Science and Arch.*, 2d ser., Vol. XVIII, 1854, p. 59. This important study has been unduly forgotten by the present, and I apprehend also by the preceding generation. Neither Bretschneider nor Hirth, in their references to *so-fu*, has ever appealed to it, and acquaintance with this treatise would doubtless have led them to better results.

² Apparently a literal translation of *t'ien ngo jung* 天鵝絨 ("silk-floss of the wild swan"). I find this term mentioned in the *T'ien kung k'ai wu* (Ch. 2, p. 46) as the name of a fur garment woven from down and feathers of hawks and wild geese.

³ G. DEVÉRIA, *Frontière sino-annamite*, p. 112.

⁴ WYLIE, *Notes on Chinese Literature*, p. 59.

and wrote an interesting account of them in his book *Ch'i yü* 赤雅,¹ mentions the bird-feather textiles under the name *niao chang* 鳥章 and discriminates between fine feather weavings styled *so-fu* 鎖袱² and coarse feather textiles termed "goose fishing-nets" (*ngo ki* 鵝罽).

This evidence permits us to infer that the term *huo ts'ui*, as applied to asbestos coming from the South-western Barbarians,³ signifies "bird-down able to resist fire," and accordingly echoes a tradition current among these barbarians themselves. If nothing else, the peculiar choice of this term, which occurs in no other text, would amply support this opinion. The conclusion that the barbarians themselves worked this fibrous asbestos into a textile would of course not be forcible; at least, it is not imperative, and it is sufficient to assume that they had gotten hold of the raw material. When we further consider that parrots⁴ and elephants named in the Annals are local products, the conclusion may be hazarded that also asbestos was found in the same region. This impression is confirmed by a statement of Yang Shên 楊慎 (1488—1559) to the effect that "fire-proof cloth is produced in Kieu-ch'ang 建昌 in Shu (Sze-ch'uan). This substance is as white as snow, and is obtained from crevices in the stones, being identical with what the Annals of the Yüan Dynasty term 'stone silk-floss' (*shi jung* 石絨)."⁵ An asbestos-producing locality in

¹ The preface is dated 1635. The passage is in Ch. A, p. 5 b of the reprint, in *Chi pu tsu chai ts'ung shu*.

² The Arabic word *ḡūf* صوف (T. WATTERS, *Essays on the Chinese Language*, p. 355).

³ The occurrence of the term in the Han Annals is an isolated instance.

⁴ In the text "trained birds," interpreted as parrots. Parrots are first mentioned in *Ts'ien Han shu* (Ch. 6, p. 6) under the name "birds able to speak" (*néng yen niao* 能言鳥). They are frequently referred to in the Annals as tribute gifts (for instance, *Kia T'ang shu*, Ch. 198, p. 9 b; *T'oung Pao*, 1904, p. 49).

⁵ *Ko chi king yüan*, Ch. 27, p. 13 (compare WYLIE, *l. c.*, p. 153). Regarding the asbestos of the Yüan see below.

Sze-ch'uan is here clearly pointed out; and this agrees with the statement of F. P. SMITH ¹ that asbestos is met with in Mao chou, Sze-ch'uan; and, as the Pai-ma-ti were settled near this region, they were very well within reach of asbestos.

It is not surprising that these "barbarians" had come into possession of asbestos; for this mineral is found on the surface in numerous places of this globe, and there are instances on record that it has accidentally been discovered even by primitive tribes. In 1770 P. S. PALLAS ² reported that the Bashkir, a Turkish tribe in the region of Yekaterinburg, had discovered on a mountain a coarse kind of asbestos of yellowish-gray hue, being exposed to the air in large pieces split lengthwise, with brittle fibres which could be pulverized into a hard white wool. In the same area he visited also the Asbestos or Silken Mountain, ³ giving a circumstantial account of the occurrence and mining there of the mineral, and mentioning also that an old woman had possessed the knowledge of weaving it into incombustible linen and gloves and making it into paper. ⁴

The most remarkable utilization of asbestos on the part of a primitive tribe is made by the Eskimo. D. CRANTZ ⁵ has the

¹ *Contributions toward the Mat. Med. of China*, p. 26.

² *Reise durch verschiedene Provinzen des russischen Reichs*, Vol. II, p. 134.

³ In Russian *Sholkovaya Gora* (*ibid.*, p. 184).

⁴ R. H. JONES (*Asbestos*, p. 37), not familiar with the interesting account of Pallas, represents the matter as though this site had been discovered only shortly before 1890, and even asserts that the Silken Mountain is said to be entirely composed of asbestos. It seems well out of the question that the Technical Society of Moscow, on whose report Jones falls back, could have made such an absurd statement, for Pallas had already said that the mountain consists principally of slate. His investigation is apt to refute also Jones's preposterous allegation that up to the present time little use has been made of asbestos in Russia and Siberia, "on account of the prevailing ignorance respecting its peculiar properties." As early as 1729 news was spread in Russia of an incombustible linen from Siberia. This referred to an asbestos-quarry discovered there about 1720 (P. J. VON STRAHLEBERG, *Nord- und östliche Teil von Europa und Asia*, p. 311, Stockholm, 1730).

⁵ *The History of Greenland*, Vol. I, p. 56, London, 1767.

following observation on the occurrence and utilization of asbestos in Greenland: "The amiantus and asbestos or stone-flax are found in plenty in many hills of this country. Even in the Weichstein are found some coarse, soft, ash-gray veins, with greenish, crystalline, transparent *radii* shooting across them. The proper asbestos or stone-flax looks like rotten wood, either of a white-gray, a green, or a red cast. It has in its grain long filaments or threads, and about every finger's length a sort of joint, and the broken end is hard and fine like a hone. But if it is pounded or rubbed, it develops itself to fine white flaxen threads. When this stone is beaten, mollified and washed several times in warm water from its limy part that cemented the threads into a stone, then dried upon a sieve, and afterwards combed with thick combs which the clothiers use, like wool or flax, you may spin yarn out of it and weave it like linen. It has this quality, that it will not burn, but the fire cleanses it instead of lye or suds. The ancients shrouded their dead, and burnt or buried them, in such incombustible linen. They still make purses or such kind of things of it for a curiosity in Tartary and the Pyrenean mountains. Paper might be made of this linen. The purified filaments may also be used as we use cotton in a lamp. But we must not imagine that the Greenlanders have so much invention: They use it dipped in train (for as long as the stone is oily, it burns without consuming) only instead of a match or chip, to light their lamps and keep them in order." In the *Encyclopædia Britannica* ¹ it is stated that "by the Eskimo of Labrador asbestos has been used as a lamp-wick." I do not know from what source or authority this statement comes; but, in view of the data of Crantz, it does not sound very probable.

Marco Polo's account has shown us that in the time of the

¹ Vol. II, p. 714.

Mongols asbestos was dug, that its preparation and weaving were perfectly understood, and that asbestos products were utilized in China. From this time onward we no longer hear of imported "fire-proof cloth," while the accounts of native asbestos increase. As early as the Sung period an attempt had been made in the Imperial Atelier to spin and weave asbestine fibres imported by the Arabs into cloth, but not with brilliant success.¹

A positive allusion to a locality where asbestos was found during the Mongol period is made in the biography of the treacherous Uigur minister Ahmed (A-ho-ma),² who, in a memorial to the Emperor Kubilai, stated that "Mount Pu-ko-ts'i 布格齊 produces asbestos, which is woven into cloth unconsumable by fire; an officer should be despatched to gather it." In the main section of the *Annals*³ the date of this memorial is fixed in the year 1267, and it is added that the Emperor indorsed it and issued an order in compliance with the request. The term for "asbestos" used in this text is *shi jung* 石絨 (literally, "stone silk floss"). We have already seen that Yang Shên (1488—1559) pronounced this term identical with what is generally known as "fire-proof cloth," that is, asbestos; and this identification is certain beyond doubt.⁴

¹ *T'ie wei shan ts'ung t'an* (already quoted above, Ch. 5, p. 20 b).

² *Yüan shi*, Ch. 205, p. 2 a. He figures among the "Villainous Ministers." Marco Polo has told his story (ed. of YULE and CORDIER, Vol. I, p. 415).

³ *Yüan shi*, Ch. 6, p. 12. ^

⁴ Giles, Schlegel, and the English and Chinese Standard Dictionary, have adopted it in this sense. The term with the same meaning is used in Japan (GEERTS, *Produits*, p. 450). Also Chang Ning 張寧 of the Ming, author of the *Fang chow tsa yen* 方洲雜言, combines the "stone silk floss" of the Mongols with the ancient tributes of fire-proof cloth (*Pien tse lei pien*, Ch. 21, p. 6; WYLIE, *l. c.*, p. 153). An analogous expression occurs in the form *shi ma* 石麻 ("stone hemp") in the *Tung ming ki* (*P'ei wên yüen fu*, Ch. 21, p. 4 b). This text would possess a veritable value if any dependence could be placed on this spurious work (see CHAVANNES and PELLIOU, *Traité manichéen*, p. 145), which may reach back to the middle of the sixth century. The passage in question, however, cannot be exactly dated, nor can the mysterious country Pu-tung be identified

In regard to the location of Monnt Pu-ko-ts'i, Wylie, who has already called attention to this passage, ¹ observed that it is difficult to identify it; but, "as asbestos is said to be found in Tartary, it is not unreasonable to suppose a coincidence in this also." G. SCHLEGEL ² writes the name of the mountain 別怯赤山, ³ translating this by "red mountains of Pie-kieh," which he places in Sze-ch'uan at 27° 12' latitude and 102° 53' longitude. ⁴

A. WILLIAMSON ⁵ seems to be the first European author to record the occurrence of the mineral in Shan-tung. Under the title "asbestos" he has the following: "This strange fossil mineral is found at King-kwo-shan, and also at Law-sze-shan. The natives use it for making fire-stoves, crucibles, and other fire-proof purposes. The fibre is good and very feathery, and by the admixture of cotton or hemp could be woven into articles of clothing. Such articles being exposed to fire and having all the alloy consumed, would

(it appears only in this passage, as shown by *Pien i tien*, Ch. 42, where Pu-tung is ranked among the unidentified countries of the East, solely with reference to this text). The allusion to asbestos is obvious. The text runs thus: "In the lake Ying-ngo 影娥池 there are ships fastened by means of 'stone veins' (*shi mo* 石脈) worked into ropes. These 'stone veins' come from the country Pu-tung 哺東, and are as fine as silk floss. They are extracted from the stone, and reeled like hempen cordage. The material is styled 'mineral hemp,' and is also made into cloth." The passage, at any rate, demonstrates that the mineral character of asbestos was known to the Chinese prior to the age of the Yüan, and possibly during the sixth century. The following text from the Persian geography of Ahmed Rūzī of the sixteenth century and relating to Egypt might eventually be enlisted for the explanation of the Chinese story. It is thus translated by C. HUANT (*Publ. de l'École des Langues Orientales*, 6th ser., Vol. V, 1905, p. 121): "Dans certaines localités croît une herbe dont on fait les cordages des gros navires; elle donne une lumière à la façon d'une chandelle; quand elle s'éteint, on la fait tourner plusieurs fois et elle redevient lumineuse."

¹ *L. c.*, p. 152.

² *Nederlandsch-chineesch Woordenboek*, Vol. III, p. 1066.

³ This is the reading of the *Fang chow tsu yen*.

⁴ It would be interesting to settle this question. Thus far, I have failed to find any indications in the *Yüan shi* regarding the site of this mountain.

⁵ *Notes on the Productions of Shan-tung* (*Journal China Branch R. As. Soc.*, Vol. IV, 1869, p. 70).

afterwards form fire-proof garments, such as ancient history speaks of, and such as are used in legerdemain. But the mineral would make most excellent fire-brick, which would be cheaper and more durable than any others. This is worthy of the consideration of the masters of the steamers on the coast." Unfortunately Williamson did not supply the technical name by which the substance is known to the Chinese. This defect was made good by F. P. SMITH,¹ who furnished the name *pu hwei mu* 不灰木 (literally, "wood without ashes;" incombustible wood), and pointed out three localities where it is obtained,—Lu-ngan fu in Shan-si, district of Yü-t'ien in Tsun-hua chou in Chi-li, and Mao chou in Sze-ch'uan. The occurrence in Shan-tung was confirmed by A. FAUVEL,² who stated that "asbestos is common in Shau-tung; pounded and mixed with soapstone it is made into crucibles, and very pretty white Chinese furnaces; they are as light as cardboard, and stand any heat; these articles are extensively made in the capital of the provinces." In this account I have full confidence, because Fauvel was a good naturalist and observer, and because I saw and collected such stoves myself. These specimens, six in number,³ were obtained at Peking in 1903; and from the description given me by Chinese, there could be no doubt that they were really made of asbestos. This impression is corroborated by Professor L. P. Gratacap, Curator of the Department of Mineralogy in the American Museum of Natural History of New York, who states that these stoves "consist of a very finely triturated asbestos, with which (purposely or adventitiously I cannot say) there is an admixture of particles of

¹ *Contributions toward the Mat. Med. of China*, p. 26.

² *China Review*, Vol. III, 1875, p. 370.

³ In the American Museum, New York (Cat. Nos. 12427, 12652—12656). A specimen is figured in the *Catalogue of the Chinese Collection for the International Health Exhibition, London, 1884*, p. 82, and is defined there as "lime stove."

limestone; there is evidently also a smearing of clay, which to a slight extent pervades also the asbestiferous mass." As this substance is designated by the Chinese in Peking *pu huei mu*, it is conclusively proved that at present this term relates to a variety of asbestos, though this does not imply that it might not refer also to other lime-like minerals which in our opinion do not come under that category. These asbestos stoves, white in color, enclosed in frames of wood or brass and heated with coal-briquettes, are much utilized in Peking and manufactured about 80 *li* in the hills toward the west of the metropolis. I could not learn the name of the village or locality.¹

GERBTS² pointed out that *pu huei mu* denotes in Japan incrustations of carbonate of lime, which settle around branches of trees immersed in a current of mineral water. This may be; in China this term refers also to petrified wood.

In reading the notes of Li Shi-chên³ on the subject of *pu huei mu*, we are struck by the fact that he does not make any allusion

¹ The *Port Catalogues of the Chinese Customs' Collection at the Austro-Hungarian Universal Exhibition, Vienna, 1873* (p. 56) contain the following entry in the Chifu collection (repeated also in later Exhibition Catalogues of the Customs): "Asbestos, *lung-ku-ni* 龍骨泥; place of production, Shan-tung; used for making fire-stoves, crucibles, etc.; the fibre woven with cotton or hemp is made into fire-proof materials." This information is spurious, and based on a misunderstanding of Williamson, who said that the fibre is good and very feathery, and by the admixture of cotton or hemp *could* be woven into articles of clothing; in fact, of course, it is not so woven by the Chinese, nor is it woven by them at all; at least, there is not the slightest evidence of this. Moreover, the term *lung-ku-ni* has nothing to do with asbestos, but denotes a medical preparation made from powdered dragon-bones, that is, bones of fossil animals.—How badly China is treated by our mineralogists, and even in otherwise complete monographs, is illustrated by the book of R. H. JONES on Asbestos. All that is said there in regard to China amounts to the one sentence (p. 39), "In China also asbestos occurs; but, apart from the manufacture of a coarse kind of cloth, we know little of any purpose to which it is there applied." I have never seen or heard of any asbestos-cloth now manufactured in China.

² *Produits*, p. 450 (see also p. 344).

³ *Pén ts'ao kang mu*, Ch. 9, p. 14 b. The translation given by F. DE MÉLY (*Lapidaires chinois*, p. 85) is an incomplete abstract from the *Pén ts'ao*.

to the "fire-proof cloth;" he does not tell us that it is identical with what anciently was called *huo huan pu*. In fact, the traditions regarding the two products are entirely distinct. Certainly *pu hwei mu* refers to the mineral, and *huo huan pu* to the finished textile product.

There is another term, *yang k'i shi* 陽起石, which likewise refers to a variety of asbestos. It is difficult to see why SMITH¹ and GEERTS² were so much exercised about this identification, the one saying that "this variety of hornblende, or greenstone, is scarcely to be called an asbestos, as it is by some writers;" the other even going so far as to impeach some foreign authors on a charge of confusion. Both Smith and Geerts were insufficiently informed on the subject; for what they describe is certainly styled by us "asbestos," whether the Chinese specimens commercially be of good or bad quality. D. HANBURY³ identified *yang k'i shi* with "asbestos tremolite,⁴ silicate of lime and magnesia;" and this is what we still include under "asbestos." It appears that this stone is used only medicinally.⁵ The *English and Chinese Standard Dictionary*⁶ lists both *pu hwei mu* and *yang k'i shi* under "asbestos."⁷

¹ *L. c.*, p. 27.

² *L. c.*, p. 448.

³ *Notes on Chin. Mat. Med.*, p. 111 (*Pharmaceutical Journal*, 1861); or in his *Science Papers*, p. 218.

⁴ This word is derived from Tremole, Mount St. Gotthard, where this variety was first found.

⁵ F. DE MÉLY, *Lapidaires chinois*, p. 105; B:OT in Bazin, *Chine moderne*, p. 556.

⁶ Vol. I, p. 112.

⁷ It should be pointed out, however, that this meaning of *yang k'i shi* is of comparatively recent origin, the exact date of which remains to be ascertained. In the older texts cited by Li Shi-chên on the subject, nothing can be found to remind us of asbestos; and the early sources are so brief and obscure that they hardly allow of any positive conclusions. Thus the *Pie lu* merely refers to Shan-tung as the place of provenience by saying that *yang k'i shi* occurs in the hills and valleys of Mount Ts'i and in Lang-ye, adding that it is the root of mica (*yün mu*, "cloud mother") in the Cloud Mountains (*Yün shan*). T'ao Hung-king states that this mineral, which is dug together with mica,

Marco Polo proved that he was possessed of a scientific mind when he exploded the salamander legend at the very moment that his Turkish acquaintance told him of how asbestos was dug and spun. The same case might be applied as a test for the scientific ability of the Chinese. True it is, the scholars of the Ming period clearly recognized the identity of the asbestos discovered under the Yüan with the imported fire-proof cloth of old. In vain, however, do we look in the literature of the Chinese for an awakening on their part, and a critical attitude toward the ancient legends, when the mining and working of the material within their boundaries has offered the opportunity ever since the days of the Mongols. The minds of Chinese scholars, at least those of the last centuries, were not trained to observation, and still less to logical conclusions based thereon, especially when these were apt radically to antagonize venerable traditions. The discovery of asbestos in China did not lead to studies by her scholars and to an overthrow of popular errors. On the contrary, the old book-knowledge persisted and triumphed. Wylie quotes the following from Chou Liang-kung 周亮工, an author who lived under the Manchu dynasty and had occasion to see a strip of asbestos cloth: "The ancients said that it was woven from the bark of a tree that grew on a burning mountain; while some say that it is from the hair of a rodent. The statement that it is from the bark of a tree, is the most

is very similar to mica, only of greater density; and that *yang k'i shi*, dug in Yü-chou together with alum (*fan shi*), is a bit yellow and black in color, but that it is only the root of alum or mica, and that the true state of affairs is not yet assured. T'ao Hung-king, accordingly, was not positive about the true nature of the substance; it may originally have been a variety of mica or alum. At any rate, it has no practical importance for the historian of asbestos, as the Chinese never made any use of it in the manner of asbestos, but only took it internally as a medicine. It should be remembered that Apollonius has allusions to mica in his account of asbestos (p. 304), and that Dioscorides and Pliny liken asbestos to alum (pp. 303, 308).

probable, as its color is more like hempen than woollen fabrics." To the credit of the Chinese, however, it must be said that Ts'ai T'iao 蔡條 of the Sung period plainly rejected the legend of the animal origin of asbestos, though he failed to grasp the real nature of the substance. It will be remembered that this author, in his work *T'ie wei shan ts'ung t'an*, reports the importation on the part of the Arabs of asbestine cloth and asbestos raw material, and that the latter was woven into textiles in the Imperial Atelier of the house of Sung. These facts impressed the Sung scholars and set them to thinking. Ts'ai T'iao makes the positive statement that asbestos is not the hair of a rodent (非鼠毛也), and that the Chinese manufactures of his time testify to the fact that the old stories are wrong.

ADDENDA.—In the letter purported to have been addressed by Prester John to the Byzantine Emperor Manuel, and written about 1165, we read the following about the salamander yielding the material for asbestine garments (F. ZARNCKE, *Der Priester Johannes I*, p. 89): "In alia quadam provincia [of India, the territory of the alleged Royal Presbyter] iuxta torridam zonam sunt vermes, qui lingua nostra dicuntur salamandrae. Isti vermes non possunt vivere nisi in igne, et faciunt pelliculam quandam circa se, sicut alii vermes, qui faciunt sericum. Haec pellicula a dominabus palatii nostri studiose operatur, et inde habemus vestes et pannos ad omnem usum excellentiae nostrae. Isti panni non nisi in igne fortiter accenso lavantur." In this description the salamander is associated with the silkworm working itself an envelope that is reeled off and spun like silk, the material being incombustible and washed in fire. In view of the popularity of the stories about Prester John in the thirteenth century, the "salamander-silk," so frequently mentioned in the texts of that period, may well be traceable to the passage in question. In one of the mediæval manuscripts edited by Zarncke (pp. 167, 170), twelve men appear before King Manuel as ambassadors of the Presbyter, and impress him by cleaning their robes of salamander-silk in flaming fire. The Presbyter's letter is instructive for another reason; for it shows, as pointed out on p. 325, that the identity of the salamander's product with asbestos was not recognized in the early middle ages. The bread, it is told there, is baked in a vessel made from asbestos; the pavement is of green topaz, which by nature is cold, to moderate the heat of asbestos (A pistoibus panis efficitur et in clibano facto

ex asbesto ponitur et coquitur. Pavimentum clibani est de topazio viridi, quae naturaliter est frigidus, ut caliditas asbesti temperetur. Alioquin panis non coqueretur sed conbureretur. Tantus est calor asbesti). The walls of a furnace in the bakery (pistrinum) were likewise of asbestos (Est enim furnus factus exterius de lapidibus preciosis et auro, interius caelum et parietes sunt de albeo lapide, cuius natura talis est, quod, semel calefactus sit, deinde inremissibiliter sine igne semper erit calidus). These passages concerning asbestos are wanting in the original text of the letter, and are interpolations occurring in manuscripts of the thirteenth century.

Falstaff, after many uncomplimentary remarks on Bardolph's personal appearance, exclaims, "I have maintained that salamander of yours with fire any time this two and thirty years; God reward me for it!" (SHAKESPEARE, 1 *Henry IV*, III 3, 52). A lizard in the midst of flames was adopted by Francis I as his badge, with the legend, *Nutrisco et extinguo*, "I nourish and extinguish" (E. PHIPSON, *Animal Lore of Shakespeare's Time*, p. 320).

P. 339, note 1. The French translation of the text in question by d'Hervey-St.-Denys has been rendered into English by S. W. WILLIAMS in his article *Notices of Fu-sang* (*J. A. O. S.*, Vol. XI, 1882, p. 98). It appears from this translation as though in the opinion of Duke Kio Volcano Island were situated in the land of the Amazons, about ten thousand *li* north-west of Fu-sang; nor is the cloth from the bark of the fiery tree mentioned in it. In the translation of Williams it runs thus: "In the middle of the kingdom is an island of fire with a burning mountain, whose inhabitants eat hairy snakes to preserve themselves from the heat; rats live on the mountain, from whose fur an incombustible tissue is woven, which is cleaned by putting it into the fire instead of washing it." In fact, the text, as reprinted in *T'u shu tsi ch'eng*, is worded as follows: "Southward [from the country of Women or Amazons], arriving at the southern shore of Volcano Island, the inhabitants on Mount Yen-kun there subsist on . . . crabs and bearded snakes in order to ward off the poisonous vapors of the volcanic heat. In this island there are fiery trees, the bark of which can be wrought into cloth. In the blazing mound live fiery rodents, whose hair can be made into stuffs. These are incombustible, and when soiled, are cleaned by means of fire" (南至火洲之南炎崑山之上其土人食蝮蟹鬍蛇以辟熱毒洲中有火木其皮可以爲布炎丘有火鼠其毛可以爲褐皆焚之不灼汚以火浣). Yen-kun is an artificially coined term, which does not appear in other texts; it is apparently intended for "blazing (*yen*) Kun-lun." The exact meaning of *sü* 蝮 is not known to me; according to K'ang-hi it is identical with 蝮蛇. The interesting feature of the above text is that the asbestos and salamander story is linked together with fabulous accounts of Fu-sang and the Amazons, and it will be remembered

that the report of a specular lens coming from Fu-sang is embodied in the same text (this volume, p. 198). If I expressed the view that this lens appears to have been of Western origin, and that Chang Yüe was familiar with traditions relating to Fu-nan, India, and Fu-lin (p. 204), this opinion is confirmed by the present case in which Chang Yüe adapts to his purpose the Fu-nan version of asbestos in combination with the salamander story.

P. 351. The country Se-tiao appears in another text of the *I wu chi*, cited in the *Chêng lei pên ts'ao* (Ch. 23, fol. 49). There, a plant is briefly described under the name *mo-ch'ü* 摩廚 (according to G. A. STUART, *Chinese Materia Medica*, p. 499, unidentified), which grows in Se-tiao; the latter, it is added, is the name of a country. If it could be proved that *mo-ch'ü* is the transcription of a Javanese name (and this is probable), the case would make an interesting contribution to the identification of Se-tiao with Ye-tiao.

LA MANDRAGORE.

PAR

BERTHOLD LAUFER.

Cou Mi 周密 (1230—1320), écrivain célèbre de la fin des Song, nous a transmis une tradition fort curieuse dans ses ouvrages *Kwei sin tsa ši* 癸辛雜識 (續集 上, p. 38, éd. du *Pai hai*) et *Či ya t'an tsa č'ao* 志雅堂雜鈔 (chap. 上, p. 40 b—41 a, éd. du *Yüe ya t'an ts'un šu*).¹

Le texte du *Kwei sin tsa ši* est ainsi conçu :

回回國之西數千里地產一物極毒全類人形若人參之狀。其曾名之曰押不蘆。生土中深數丈。人或誤觸之著其毒氣必死。取之法先於四旁開大坎可容人。然後以皮條絡之。皮條之系則繫于犬之足既而用杖擊逐犬。犬逸而根拔起。犬感毒氣隨斃。然後就埋土坎中。經歲然後取出曝乾。別用他藥制之。每以少許磨酒飲人則通身麻痺而死。雖加以刀斧亦不知也。至三日後別以少藥投之即活。蓋古華陀能剗腸滌胃以治疾者必用此藥也。今聞御藥院中亦儲之。白廷玉聞之盧松崖。或云。今之貪官汚吏賊過盈溢被人所訟則服百日丹者莫非用此。

¹ Sur cet auteur, sa vie et son œuvre, cf. Pelliot, *T'oung Pao*, 1913, p. 367—368.

Voici le texte du *Či ya t'an tsa č'ao*:

回回國之西數千里地產一物極毒全似人形如人參之狀。其名押不盧。生於地中深數丈。或從傷其皮則爇。毒之氣著人即死。取之之法先開大坑令四旁可容人。然後輕手以皮條結絡之。其皮條之前則繫於大犬之足既而用杖打犬。犬奔逸則此物拔起。大 [pour 犬] 感此氣即斃。然後別埋他土中。經歲後取出暴乾。別用藥以製治其性。以少許磨酒飲之即通身麻痺而死。雖刀斧加之不知也。然三日別以少藥投之即活。蓋古者華陀能剗腸滌臟治疾者或用此藥也。聞今御藥院中有二枚此神藥也。白廷玉聞之盧松崖云。 Le texte s'interrompt ici et n'est pas terminé.

Ni l'un ni l'autre texte ne semble être en parfait état, mais celui du *Kwei sin tsa ši* (A) est certainement le meilleur et le plus complet. Il est à la base de la traduction qu'on va lire, tandis que les divergences de la rédaction du *Či ya t'an tsa č'ao* (B) sont ajoutées en crochets.

“Quelques milliers de li à l'ouest des pays mahométans le sol produit une chose excessivement vénéneuse et pareille dans son ensemble à la figure d'un homme; en effet, elle a l'apparence du ginseng. On l'appelle *ya-pu-lu* (*ya-pou-lou*). Cette plante croit dans la terre jusqu'à une profondeur de plusieurs toises. Si un homme se heurte contre la plante par erreur, il recevra son exhalaison vénéneuse et doit mourir. [B: Quand on la blesse, son écorce brille; l'exhalaison du poison pénètre dans l'homme qui meurt aussitôt.] Voici la méthode de prendre la plante. D'abord, aux quatre côtés (autour de la racine) on creuse un trou assez grand pour recevoir un homme [B: D'abord on creuse une grande fosse

dont les quatre côtés soient assez spacieux pour recevoir un homme]. Ensuite on lie la plante au moyen d'une lanière de cuir dont l'extrémité est attachée aux pieds d'un grand chien [B: Ensuite on lie la plante légèrement au moyen d'une lanière de cuir, dont la partie antérieure est attachée aux pieds d'un grand chien]. Avec un bâton on bat et chasse le chien qui s'enfuit en entraînant avec lui la racine. Accablé de l'exhalaison du poison, le chien périt sur le champ. Alors on ensevelit la racine dans un trou du sol [B: dans un autre sol], et au bout d'un an on l'en sort pour la sécher au soleil. Elle est mélangée avec d'autres ingrédients [B: pour dominer sa nature] et en chaque cas on en râpe un peu dans du vin qu'on donne à boire à un homme; le corps entier de celui-ci en sera paralysé, et il tombera en torpeur comme s'il était mort. Même si on lui applique des couteaux ou des haches, il ne s'en apercevra pas. Au bout de trois jours si une petite dose de médecine lui est administrée, il reviendra à la vie. C'est peut-être là le remède employé par Hwa T'o qui anciennement était capable d'ouvrir les intestins et de purger l'estomac pour guérir des malades.¹ Or j'ai entendu dire qu'une provision de cette médecine [B: deux pièces, c'est une médecine divine] est conservée dans la Pharmacie Impériale.² C'est Pai T'in-yü qui l'a appris de Lu Suñ-yai.

¹ Hwa T'o est le célèbre médecin et chirurgien qui mourut en 220 de notre ère. Cf. surtout la notice de Chavannes, *BEFEO*, III, 1903, p. 409. Comme M. Chavannes fait remarquer d'après le *Hou Han lu*, l'anesthétique employé par Hwa T'o était du chanvre infusé dans du vin qui excitait et étourdissait le patient. Donc la conclusion de Çou Mi n'est pas juste. Cf. aussi C. Pétilion, *Allusions littéraires*, p. 380, et *T'oung Pao*, 1898, p. 237—238; S. Julien, *Chirurgie chinoise. Substance anesthétique employée en Chine, dans le commencement du III^e siècle de notre ère, pour paralyser momentanément la sensibilité* (*Comptes rendus hebdomadaires des séances de l'Académie des Sciences*, XXVIII, 1840, p. 195—198). L'information est extraite de l'ouvrage médical *Ku kin i tun* du commencement du XVI^e siècle. Voir aussi Flückiger et Hanbury, *Pharmacographia*, p. 547. Sur les propriétés narcotiques du chanvre connues dans l'Inde, cf. C. Joret, *Les plantes dans l'antiquité*, II, p. 645.

² Cf. Bazin, *Notice historique sur le collège médical de Péking*, p. 24—25 (extrait du *Journal asiatique*, 1856).

Quelques uns disent: les officiers avides et les fonctionnaires oppressifs du temps présent, quand ils ont fait des exactions excessives et qu'ils sont accusés, prennent de la drogue dite drogue de cent jours; ne serait-ce pas cette plante dont ils se servent?"

Il semble que Čou Mi soit resté le seul auteur chinois à parler de la plante *ya-pu-lu*. Du moins, Li Ši-čen, dans son *Pen ts'ao kan mu* (chap. 17 卅, p. 13 b), ne cite-t-il que le texte du *Kwei sin tsa ši* à propos du *ya-pu-lu*; il le cite d'ailleurs assez inexactement, en supprimant le conte du chien et en ajoutant au préambule les mots 漠北 *mo pei*, "au nord du désert Gobi."¹ La dernière phrase il l'a changée ainsi: 貪官汚吏罪甚者則服百日丹皆用此也. C'est à ce texte que se rapporte la brève note de Stuart,² qui fait remarquer qu'il n'y a pas de description de la plante, et que son identification demande de nouvelles recherches. De même, J. L. Soubeiran et Dabry de Thiersant³ ont déjà noté la plante *ya-pu-lu* d'après le *Pen ts'ao* sous le titre *Atropa* (avec point d'interrogation), en disant: "Décrit par le *Pen ts'ao* comme déterminant une anesthésie suffisante pour permettre de faire des opérations. On dit que l'action s'en fait sentir pendant trois jours; il aurait été employé par le chirurgien Houa-to, pour des opérations intéressant les intestins."

Il est surprenant de voir ce que l'encyclopédie *Ko či kin yūan* 格致鏡原 (chap. 69, p. 5 b) a fait du texte du *Kwei sin tsa ši*. Ici la plante est introduite sous le titre "herbe qui réveille de la

¹ Cette addition est donnée aussi par le *Yūan kien lei kan* (chap. 411, p. 22) dans un autre texte, de seconde main et mal digéré, concernant le *ya-pu-lu*. Le *P'ei wen čai kwan k'ün fan p'u* (chap. 97, p. 25 b; Bretschneider, *Bot. Sin.*, I, p. 70) contient le même texte écourté, sans le conte du chien, mais avec l'introduction correcte 回回地方.

² *Chinese Materia Medica*, p. 59; voir déjà F. P. Smith, *Contributions towards the Materia Medica of China*, p. 36. Smith dit sans raison que la plante vient du pays des Huns ou des Ouigours.

³ *La matière médicale chez les Chinois*, p. 190 (Paris, 1874).

mort et qui rétablit la vie" 起死回生草.¹ Naturellement Çou ne veut pas dire que l'homme qui prend la 'potion meurt réellement et ressuscite au bout de trois jours, mais seulement qu'il reste sans conscience pendant cet intervalle. S'il mourait, l'expérience de frapper le corps avec un couteau n'aurait aucun sens. Qu'il est insensible aux coups c'est la merveille; par conséquent, la vie n'est pas encore éteinte. Le conte du chien est éliminé, et le document entier est abrégé ainsi: 一名押不盧。出回回國以少許磨酒飲人則通身麻痺而死。雖加以刀斧亦所不知。至三日別以少藥投之即活。御苑中亦儲之。 Ce texte corrompu et mutilé fut adopté par G. Schlegel,² qui fit venir la plante de l'Arabie (au lieu des pays mahométans), l'attribua au palais impérial et induisit en erreur P. J. Veth.³

La plante décrite par Çou Mi peut être identifiée sans difficulté avec la mandragore sur la base de la transcription *ya-pu-lu*, laquelle correspond exactement à l'arabe-persan *abruh* ابروح ou *yabruh* يبروح, désignation pour le fruit de cette plante.⁴ Elle-même s'appelle en

¹ Selon le *P'ei wen tsai kwan k'un fan p'u* et le *T'u lu tsai t'ien* cette définition émane du *Tien tsai ki* 演載記.

² *Nederlandsch-chineesch Woordenboek*, IV (supplément), p. 25.

³ *Archives internat. d'ethnographie*, VII, 1894, p. 82.

⁴ Selon d'Herbelot (*Bibliothèque orientale*, I, p. 72) les Persans appellent aussi communément cette plante *esterenk* [astoreng] et les botaniques arabes ont formé par corruption les noms d'*iabroug* et d'*iabrouh* qu'ils lui donnent, du mot persan *abrou*. L'origine perse du mot est plaidée aussi par Wetzstein (*ZE*, 1891, p. 891) et Veth (*Archives internat. d'ethnographie*, VII, 1894, p. 200) qui pour cette raison ont hasardé l'opinion que, de même, les notions magiques sur la mandragore auraient pris leur origine en Perse. C'est une hypothèse qui ne s'inspire que de considération purement philologique sur les mots; les preuves historiques font défaut: Il n'y a pas de texte iranien de date ancienne à ce sujet. Pour la première fois la mandragore est mentionnée dans la littérature perse par Abu Mansur, qui autour de l'an 975 écrivit son Livre des Principes Pharmacologiques (traduction d'Achundow, p. 148). Baber écrit dans ses Mémoires que la mandragore se trouve dans les montagnes du Fergana (A. S. Beveridge, *Memoirs of Bābur*, p. 11). Il est difficile de se ranger à l'avis de Wetzstein que l'arabe *yabrūš* serait issu du persan *abrewi*. Voir aussi Horn, *Grundr. iran. Phil.*, I, 2, p. 73.

arabe *toffāh-el-jenn* تفاح الجن ("la pomme des esprits") ou *sirāj el-kotrob* سراج القطرب ("la lampe des lutins"), aussi *la'ba* لعبه et *beid el-jinn* ("œufs des esprits").¹ En Araméen le fruit est nommé *yawruha* ܝܘܪܘܚܐ; et la forme *jerābah* جرابح est usuelle en Syrie. Ce nom sémitique paraît être d'une date relativement ancienne; du-moins trouvons-nous dans Dioscoride un terme dit égyptien de la forme ἀπεμούμ laquelle, selon moi, semble être apparentée à l'arabe *abruh*: peut-être ce mot est-il à corriger en ἀπερούμ. La mandragore (ou mandegloire par étymologie populaire)² forme un genre de la famille des solanées à la racine fusiforme et souvent bifurquée, aux feuilles radicales d'un vert sombre, aux fleurs purpurines et dont les fruits rouges, semblables à une petite pomme, exhalent une odeur agréable.³ Les propriétés narcotiques de cette

¹ L. Leclerc, *Traité des simples*, II, p. 246; III, p. 240; d'Herbelot, *Bibliothèque orientale*, III, p. 524. Les Arabes ont emprunté aux Grecs aussi le mot *mandragoras* dans la forme *mandaghuru* (Leclerc, III, p. 341).

² Francisque-Michel, *Recherches sur le commerce, la fabrication et l'usage des étoffes de soie*, II, p. 76, Paris, 1854) a fait cette observation: "Au XVe siècle, ils [nos ancêtres] employaient la soie à conserver certaines amulettes, dont un célèbre prédicateur de l'époque brûla un grand nombre, ce qui valait mieux assurément que de brûler les gens qui y avaient foi. On les appelait *madagaires*, par une altération du mot *mandragores*. 'Aujourd'hui, ajoute l'auteur du Journal du roy Charles VII, le vulgaire les appelle mandegloires, que maintes sottes gens gardoient en lieux de repos, et avoient si grande foy en celle ordure, qu'ils croyoient fermement que tant comme ils l'avoient (mais qu'il fust bien nettement en beaux drapeaux de soye ou de lin envelopé), jamais jonr de leur vie ne seroient pauvres.' Dans le dialogue de Mathurine et du jeune du Perron, celui-ci lui dit: 'As-tu point aidé à souffler le feu lent sous la coque d'œuf où est le germe, la soye crainoisie, et cela de quoy les magiciens faisoient leur pûque avec la petite mandragore?' (Confession catholique du sieur de Sancy, liv. II, ch. 1er)." Aussi l'expression *main de gorre* était en usage populaire.

³ C. Joret, *Les plantes dans l'antiquité et au moyen âge*, I, p. 498. — "La *Mandragora officinarum* est connue sous le nom de *Mandragore femelle*. Elle est très commune dans le midi de la France, on la rencontre en abondance sur les rivages de la Calabre, de la Sicile, de l'île de Crète, de la Cilicie, de l'Afrique, de l'Espagne; elle se plaît dans les lieux ombragés, sur les bords des rivières, à l'entrée des cavernes. Elle fleurit en automne, quelquefois aussi au printemps. Sa racine est grosse, noirâtre extérieurement, blanche à l'intérieur, charnue; ses feuilles sont grandes, les plus extérieures obtuses, les plus intérieures aiguës; leur couleur est un vert bleuâtre, luisant en dessus, terne en dessous. Le pétiole est long; les hampes florales sont longues, rougeâtres, et un peu pentagonales.

plante étaient connues anciennement, et elle était douée de vertus magiques, aphrodisiaques et prolifiques. La racine prend souvent des formes singulières, rappelant plus ou moins le corps de l'homme. Le nom est dérivé du grec *μανδραγόρας*, mot dont l'étymologie est encore inconnue. D'après Littré, ce paraît être un nom d'homme appliqué à une plante, et contenir *μάνδρος* ou *μάνδρα*, nom d'une divinité locale de l'Asie Mineure. L'origine orientale de plusieurs croyances attachées à cette plante, comme nous verrons, paraît certaine. Assurément, le nom n'a rien à voir avec le persan *mandum-giyā* *مردم گيا*, comme supposent Wetzstein¹ et Schrader.²

Ce n'est pas le but de cette notice de retracer toutes les croyances touchant les vertus de la mandragore et accumulées pendant beaucoup de siècles. Un tel travail a été maintes fois tenté, mais, à vrai dire, aucun essai de ce genre n'est tout à fait satisfaisant ou complet dans l'emploi des sources.³ Une œuvre d'ensemble et

La fleur se compose d'un calice à cinq divisions aiguës et lanceolées, d'une corolle trois fois plus longue que le calice, de couleur violette et découpée en cinq lobes oblongs, obovés" (A. Milne Edwards, *De la famille solanacées*, p. 56, Paris, 1864).

¹ L. c.

² *Reallexikon*, p. 36. Une nouvelle hypothèse sur l'affinité du nom grec se trouve à la conclusion de cet article.

³ Il y a trois monographies que je n'ai pas eu l'occasion de voir, J. Schmidel, *Dissertatio de mandragora* (Lipsiae, 1671); Granier, *Dissertation botanique et historique sur la mandragore* (Paris, 1788); et Bartolomi, *Commentarii de mandragoris* (Bologna, 1835). Ce sont les traités suivants qui me sont connus: F. v. Luschan a illustré six racines de mandragore de l'Orient proche sculptées en figures humaines (*ZE*, XXIII, 1891, p. 726—728); sa brève notice est accompagnée de notes explicatives par Ascherson et Beyer (p. 729—746) et de notes additionnelles par Wetzstein (p. 890—892). — W. Hertz, *Sage vom Giftmädchen*, traite de la mandragore dans un appendice (*ABAW*, 1893, p. 164—166). — P. J. Veth, *De alruin en de heggerank* (*Archives internationales d'ethnographie*, VII, 1894, p. 81—88) et *De mandragora* (*ibid.*, p. 199—205). — C. B. Randolph, *The Mandragora of the Ancients in Folk-Lore and Medicine* (*Proceedings American Academy of Arts and Sciences*, XL, Boston, 1905, p. 487—537). — E. O. v. Lippmann, *Alraun und schwarzer Hund*, dans ses *Abhandlungen*, I, 1906, p. 190—204. — Comme on suppose qu'il s'agit de la mandragore dans l'Ancien Testament (דָּוְדָ'ִים *dūda'im*, "plante d'amour", dérivé de *dūd*, "aimer"; *Gen.*, XXX, 14—16, et *Cant.*, VII, 14), on trouve des articles à ce sujet dans les nombreux dictionnaires bibliques; le meilleur que j'aie vu est celui de E. Levesque

de critique reste à faire. Les notes suivantes ne doivent être regardées que comme un commentaire du texte de Čou Mi; toutefois rien d'important n'y est omis.

au *Dictionnaire de la Bible* par F. Vigouroux (IV, col. 653—655). Il ne faut pas oublier que cette interprétation du terme hébreux repose sur une hypothèse, d'ailleurs fort vraisemblable, suggérée par les traductions *μηλα μανδραγόρου* des Septante, *mandragora* de la Vulgate, et *yādrūšin* du Targum d'Onkelos et du syriaque, en outre, la plante est répandue en Palestine. — Le savant japonais Kumogusa Minakata (*Nature*, LI, 1895, p. 608; et LIV, 1896, p. 343—344; cf. *T'oung Pao*, 1895, p. 342) a contribué deux brèves notices à ce sujet en se servant de sources chinoises, mais sans méthode et critique. Je ne veux pas entrer dans une critique détaillée de ce travail, mais je voudrais remarquer seulement que ses rapprochements entre la mandragore et la plante *šan-lu* 商陸 (*Phytolacca acinosa*) ne sont que des parallèles psychologiques, mais non historiques (voir *infra*). Minakata a aussi donné une traduction du conte de Čou Mi avec quelques contre-sens sans consulter le texte meilleur du *Kwei sin tsai hi*, et a fait allusion à Joseph par des sources de seconde main. Je ne dois rien à cette étude; en effet, j'ai trouvé tous les textes indépendamment, et mon travail était achevé quand par hasard l'article de Minakata est tombé dans mes mains. — Niccolò Macchiavelli (1469—1527) est l'auteur d'une comédie, d'abord intitulée *Comedia di Callimaco et di Lucrezia* (1re édition, s.l.n.d.), puis *Mandragola* (1524, etc.; éd. sous mes yeux, Roma, 1688), en cinq actes, en prose, précédée d'un prologue; c'est une satire sur la croyance à la vertu de la mandragore pour féconder une femme. Callimaco dit à Messer Nicia (p. 63): "Voi havete a intendere questo, che uò ò cosa piu certa a ingravidare d'une potione fatta di Mandragola, questa è una cosa esperimētata da me due para di volte, et trovata sempre vera: e se non era questo, la Reina di Francia sarebbe sterile, e infinite altre principesse di quello stato." La comédie de Machiavel a fourni à J. de la Fontaine le sujet d'un conte rimé qui est intitulé "La Mandragore, nouvelle tirée de Machiavel" (*Oeuvres de J. de la Fontaine* par H. Regnier, tome V, 1889, p. 22, avec une introduction intéressante de l'éditeur).

"Cette recette est une médecine
Faitte du jus de certaine racine,
Ayant pour nom mandragore; et ce jus
Pris par la femme opère beaucoup plus
Que ne fit onc nulle ombre monacale
D'aucun couvent de jeunes frères plein".

La *Mandragola* a été imitée par J.-B. Rousseau dans sa comédie *la Mandragore*, également en cinq actes, en prose, "tirée, dit le titre, de l'italien de Machiavel". Andrea Calmo écrivit *la Potione, comedia facettissima et dilettevole*, en quatre actes et un prologue, imitation de la *Mandragola*, écrite dans les dialectes vénitien, bergamasque, italo-grec, etc. (Venise, 1552, réimprimée en 1560, 1561, et 1600). Il y a une nouvelle de Charles Nodier, intitulée *la Fée aux miettes* (1832), dont le héros, pour posséder sa maîtresse, doit trouver "la mandragore qui chante". Une nouvelle allemande *Mandragora*, d'ailleurs assez faible, par de la Motte Fonqué, a paru en 1827.

L'historiette du chien déracinant la plante ne se trouve ni dans Pline ni dans Dioscoride qui l'un et l'autre ont écrit sur la mandragore. La version la plus ancienne que nous connaissions est due à Flavius Josèphe (37—93) qui dans son œuvre *De bello judaico* (VII, 6, § 3), écrit entre les années 75 et 79, s'exprime ainsi: ¹ "Or dans ce palais croissait une espèce de rue ² qui mérite notre admiration à cause de ses dimensions, car elle était aussi large qu'un figuier en ce qui concerne la hauteur et l'épaisseur; et, suivant une tradition, elle avait duré depuis le temps d'Hérode, et probablement elle aurait continué beaucoup plus longtemps si elle n'avait pas été tranchée par les Juifs qui occupaient la place plus tard. Et dans la ravine qui environne la cité [Machaerus] au côté du nord, il y a une certaine place nommée Baaras et produisant une racine du même nom. Sa couleur est semblable à celle du feu, et vers le soir, elle émet un rayon comme un éclair. Elle n'est pas prise aisément par ceux qui s'approchent d'elle et désirent l'enlever, mais elle se retire de leurs mains et n'est pas stationnaire jusqu'à ce que l'urine ou le sang menstruel d'une femme soient versés au-dessus d'elle. Même alors ceux qui la touchent rencontreront une mort certaine s'ils ne portent suspendue à la main une racine de la même espèce. Il y a aussi une autre méthode de l'ôter sans risque, et la voici. Les gens creusent le sol autour de la plante jusqu'à ce que la partie cachée de la racine devienne fort petite. Alors ils y lient un chien, et quand le chien suivra la personne qui l'a lié la racine est arrachée sans difficulté; mais le chien expire infailliblement, comme s'il était une victime au lieu de l'homme qui devait prendre la plante. Après cela, personne n'a besoin de craindre de la prendre dans ses mains. Cependant, après tous ces dangers qu'on court à

¹ *Flavii Josephi opera graece et latine* ed. G. Dindorfus, II, p. 316 (Parisii, 1865)

² Une herbe de la famille *Rutaceae*, mentionnée par Luc (XI, 42). Plusieurs espèces sauvages croissent en Palestine, tandis qu'une espèce, *Ruta graveolens*, est cultivée.

l'obtenir, elle n'est recherchée qu'en considération d'une seule propriété qu'elle a, à savoir que, apportée à des malades, elle chassera vite les démons (qui ne sont autres que les esprits des méchants) qui entrent dans les hommes vivants et les tuent, s'ils ne peuvent pas obtenir de secours contre eux." ¹

La cité de Baaras était située en Syrie, sur le bord oriental de la mer Morte. Josèphe ne donne pas le nom de la plante, mais il n'y a pas de doute qu'il ait envisagé la mandragore qui existe en Palestine. Le motif de la racine arrachée par un chien paraît être d'origine orientale, et ensuite fut adopté par l'hellénisme lequel a absorbé tant d'idées orientales. ²

Un conte semblable est raconté par Élien (*Hist. an.* XIV, 27) qui nomme la plante *cynospastus* (κυνόσπαστος, "déraciné par un chien")

¹ Ἐπιφύκει δ' ἐν τοῖς βασιλείοις καὶ πήγανον ἄξιον τοῦ μεγέθους θαυμάσαι· συκῆς γὰρ οὐδεμιᾶς ὕψους καὶ πάχους ἀπελείπετο. Λόγος δ' ἦν ἀπὸ τῶν Ἡρώδου χρόνων αὐτὸ διαρκῆσαι, κἂν ἐπὶ πλεῖστον ἴσως ἔμεινεν· ἐξεκόπη δ' ὑπὸ τῶν παραλαβόντων τὸν τόπον Ἰουδαίων. Τῆς φάραγγος δὲ τῆς κατὰ τὴν ἄρκτον περιεχοῦσης τὴν πόλιν Βαάρας ὀνομάζεται τις τόπος, φύει τε ῥίζαν ὀμωλύμως λεγομένην αὐτῷ. Αὕτη φλογὶ μὲν τὴν χροαῖν ἔοικε, περὶ δὲ τὰς ἐσπέρας σέλας ἀπαστρέπτουσα τοῖς ἐπιούσι καὶ βουλομένοις ληθεῖν αὐτὴν οὐκ ἔστιν εὐχεύρωτος, ἀλλ' ὑποφεύγει, καὶ οὐ πρότερον ἴσταιται πρὶν ἢν τις οὖρον γυναικὸς ἢ τὸ ἔμμηνον αἷμα χέῃ κατ' αὐτῆς· οὐ μὴν ἀλλὰ καὶ τότε τοῖς ἀψαμένοις πρόδηλός ἐστι θάνατος, εἰ μὴ τύχῃ τις αὐτὴν ἐπεῖνην ἐπενεγκάμενος τὴν ῥίζαν ἐκ τῆς χειρὸς ἀπηρτημένην. Ἀλίσκεται δὲ καὶ καθ' ἕτερον τρόπον ἀκινδύνως, ὅς ἐστι τοιοῦτος. Κύκλω πᾶσαν αὐτὴν περιορύσσουσιν, ὡς εἶναι τὸ κρυπτόμενον τῆς ῥίζης βραχύτατον, εἴτ' ἐξ αὐτῆς ἀποδοῦσι κύνα, κακείου τῷ δήσαντι συνακολουθεῖν ὀρμήσαντος, ἢ μὲν ἀνσπᾶται ῥαδίως, θνήσκει δ' εὐθύς ὁ κύων, ὡς περ ἀντιδοθεὶς τοῦ μέλλοντος τὴν βοτάνην ἀναιρήσεσθαι. Φόβος γὰρ οὐδεὶς τοῖς μετὰ ταῦτα λαμβάνουσιν. Ἔστι δὲ μετὰ τοσούτων κινδύνων διὰ μίαν ἰσχὺν περισπούδαστος· τὰ γὰρ κλυόμενα δαιμόνια (ταῦτα δὲ πονηρῶν ἔστιν ἀνθρώπων πνεύματα) τοῖς ζῶσιν εἰσδυόμενα καὶ κτείνοντα τοὺς βοηθείας μὴ τυγχάνοντας, αὕτη τυχῶς ἐξελαύνει, κἂν προσενεχθῆ μόνον τοῖς νοσοῦσι.

² Je m'abstiens d'aborder le problème botanique. Dans la plupart des cas il est impossible d'insister sur une identification trop spécifique. *Mandragora officinalis*, *Atropa mandragora*, ou même *Atropa belladonna* ont été proposées comme les plantes comprises par les anciens à ce titre. Je ne crois pas cependant qu'une seule espèce y corresponde, car les mêmes idées pouvaient passer d'une plante à l'autre. On sait que la mandragore n'a jamais pénétré au-delà des Alpes sauf dans le midi de la France; néanmoins on a réussi à en trouver des substituts dans l'Europe centrale et septentrionale.

ou *aglaophotis* (*ἀγλαόφωτις*,¹ "lumière brillante"). Selon lui, la plante est cachée au-dessous parmi les autres herbes pendant le jour, tandis que de nuit elle devient visible et luisante comme une étoile, car elle rayonne et ressemble à du feu (*Φλογώδης γὰρ ἐστὶ καὶ ἕοικε πυρὶ* = 熾 ou 晃). Par conséquent les gens attachent un signe distinctif à la racine et s'éloignent. Sans cette précaution, ils ne peuvent pas se souvenir au jour de la couleur ni de la figure de la plante. Mais ils n'ont pas coutume d'extraire ce végétal eux-mêmes, car on dit que celui qui l'a touché par ignorance de sa nature meurt quelque temps après. On conduit donc un chien jeune et robuste qui n'a point reçu de nourriture pendant quelques jours et qui a une faim violente; on le lie à une corde forte aussi loin que possible, et l'on fait un nœud difficile à dénouer, autour du bas de la tige de l'*aglaophotis*. Un repas opulent de viande rôtie, d'une odeur suave, est présenté au chien qui, poussé par la faim et attiré forcément par la bonne odeur de la viande, arrache la plante avec la racine. Quand le soleil regarde la racine, le chien mourra aussitôt. Les gens l'ensevelissent à la même place, et ayant rempli quelques cérémonies mystérieuses en honorant le cadavre du chien, parce qu'il a laissé sa vie pour eux, ils osent toucher le végétal et le portent chez eux. Ils l'emploient pour beaucoup de choses utiles, et à ce qu'on dit, ceux qui souffrent de l'épilepsie en sont guéris; elle est bonne aussi pour la maladie des yeux.

Le conte d'Élien, sans doute un peu loquace, n'est pas localisé, et est un peu exagéré: il n'y a guère de lieu pour le repas, à moins que ce ne fût un acte de charité. Le texte d'Élien qui vécut à Praeneste en Italie sans jamais quitter ce pays démontre que le conte fit sa migration de l'Orient en Italie.

Pline, afin d'illustrer les mensonges des magiciens anciens, dit que dans sa jeunesse le grammairien Apion lui parla de la plante

¹ Cf. Pline XXIV, 102.

cynocephalia ("tête de chien"), connue en Egypte sous le nom d'*osiritis*, utile pour la divination et préservatif contre tous les mauvais effets de la magie; mais si quelqu'un l'arrache du sol dans sa totalité, il mourra aussitôt.¹ C'est la même superstition que nous avons trouvée dans Josèphe et Élien, et ici même l'Orient (l'Egypte et les magiciens) paraît en prendre la responsabilité. Si le nom *cynocephalia*, qui avant tout se rapporte à la forme de la plante, permet d'établir un rapprochement avec le chien de Josèphe et d'Élien, c'est ce que je n'ose décider.²

La légende occidentale reproduite par Çou Mi présuppose évidemment une version d'origine islamique qui doit s'être répandue en Chine à l'époque des Song. Eu consultant la vaste compilation d'Ibn al-Baitār dans l'excellente traduction de L. Leclerc,³ nous n'en trouvons pas de trace. Malheureusement, Leclerc a cru bon d'éliminer quelque chose de cet article, car il ajoute: "Quelques passages de ce chapitre, qui tranche par son caractère sur le ton général de l'ouvrage d'Ibn al-Baitār, nous ont paru devoir être supprimés." J'ai donc recouru à la traduction de Sontheimer, laquelle, comme on sait, est bien inférieure à celle de Leclerc à tous égards, et j'attends, d'ailleurs, la confirmation de ce texte par un arabisant. Selon Sontheimer,⁴ Ibn al-Baitār mentionnerait le procédé avec le chien et ajouterait que lui-même en a été témoin, mais qu'il a trouvé faux que le chien y perde sa vie.

¹ Quærat aliquis, quæ sint mentiti veteres Magi, cum adolescentibus nobis visus Apion grammaticæ artis prodiderit cynocephalian herbam, quæ in Aegypto vocaretur osiritis, divinam et contra omnia veneficia, sed si tota erueretur, statim eum, qui eruisset, mori (XXX, 6, § 18).

² Dans un autre passage de Pline (VIII, 27, § 101) les fruits de la mandragore sont nuisibles aux ours qui lèchent des fourmis comme antidote (Ursi cum mandragoræ mala ustavere, formicæ lambunt); cf. Solinus (XXVI, 8): Cum gustavere mandragoræ mala, moriuntur: sed eunt obviam, ne malum in perniciem convalescat et formicæ vorant ad operandam sanitatem.

³ *Traité des simples*, II, p. 246—248.

⁴ II, p. 14.

Dans la traduction de Leclerc l'auteur arabe fait dire à Hermès à propos de l'acquisition de la plante qu'on prétend que son extraction est difficile par la raison qu'il faut connaître le temps favorable à l'opération.¹ D'autre part, d'Herbelot² a révélé une version qui s'approche assez nettement du texte de l'écrivain chinois. "Luthf-Allah dit qu'il y a du danger d'arracher, ou de couper cette plante, et que pour éviter ce danger, quand on veut la tirer de terre, il faut attacher à sa tige un chien que l'on bat ensuite, afin que faisant des efforts pour s'enfuir, il la déracine." Voilà le trait de battre le chien, étranger à Josèphe et Élien, mais admis dans la version chinoise. Cependant un parallèle arabe plus complet et plus exact reste à chercher. D'ailleurs, autant que je sache, il n'y a pas beaucoup d'originalité dans les notices des Arabes sur la mandragore. Par exemple, tout ce qui est rapporté par Qazwīnī à ce sujet, comme l'a reconnu aussi G. Jacob,³ n'est que l'écho des traditions hellénistiques. Qazwīnī a copié Avicenne (980—1037), et Avicenne a été répété par les historiographes européens des croisades et d'autres écrivains médiévaux. Enfin, les auteurs byzantins comme Théophane et Kedrenos ne font que reproduire les traditions des anciens.

Pour ce qui est des propriétés lumineuses de la plante, nous les avons vues accentuées par Josèphe et Élien. Le chérif el-Edrisy fait remarquer: "On donne à cette plante le nom de *sirāj el-kotrob*, parce que le *kotrob* est cette petite bête qui luit la nuit comme du feu. Cette plante est bien connue en Syrie où elle croît surtout non loin du littoral. La partie interne de l'écorce de sa tige luit la nuit, tant qu'elle reste humide, au point qu'on la croirait embrasée. Une fois desséchée, elle perd cette propriété. Si on la met

¹ L. Leclerc, *Traité des simples*, II, p. 247.

² *Bibliothèque orientale*, I, p. 72.

³ *Studien in arabischen Geographien*, p. 105.

dans un linge mouillé, l'humidité lui rend cette lueur qu'elle perd en se desséchant." ¹

La forme anthropomorphique de la plante (plus correctement de la racine) sur laquelle insiste Čou Mi n'est pas relevée par les auteurs classiques. Dioscoride décrit la racine ² sans mentionner cette qualité. Cependant, nous apprenons par une citation du *Codex neapolitanus* de Dioscoride que la racine de la mandragore était intitulée *ανθρωπόμορφος* dans l'ouvrage perdu du Pseudo-Pythagore sur les effets des plantes. De même, Columella (*De re rustica* X, 19, 20) en parle au terme *planta semihominis*.

Hermès est cité par Ibn al-Baitār comme disant: "La racine souterraine de cette plante a la forme d'une idole debout, avec des pieds et des mains et tous les organes de l'homme. Sa tige et ses feuilles, issues de la tête de cette idole, apparaissent à l'extérieur, et les feuilles ressemblent à celles de la ronce. Elle s'attache aussi aux plantes qui l'avoisient et s'étale par-dessus." ³

La qualité soporifique de la plante est signalée par Aristote (*De somno et vigilia*), Théophraste (*Hist. plant.* IX, 9, 1) et Xénophon (*Symp.* II, 24). Dioscoride (IV, 76) dit qu'elle fournit un suc endormant, étourdissant ou même mortel, employé par les médecins comme anesthésique sous forme de vin pour les opérations chirurgicales et qu'elle s'atteste comme aphrodisiaque efficace.

Lucien fait deux allusions à cet effet du remède: "tu dors, comme assoupi par de la mandragore"; et Demosthène réveille, malgré eux, ses concitoyens assoupis comme s'ils avaient bu de la mandragore. ⁴

¹ L. Leclerc, *Traité des simples*, II, p. 247.

² Les racines sont très longues, au nombre de deux ou trois, intriquées l'une dans l'autre, noires en dehors, blanches en dedans et recouvertes d'une écorce épaisse (L. Leclerc, *Traité des simples*, III, p. 419); mais Pline et Dioscoride sont d'accord pour rapporter que la plante se présente sous deux sexes, mâle et femelle.

³ L. Leclerc, *Traité des simples*, II, p. 247.

⁴ E. Talbot, *Oeuvres complètes de Lucien de Samosate*, I, p. 31; II, p. 474 (*Tim.* 2, *Dem. Enc.*, 30).

Pline aussi en signale la force soporifique, mais la dose devait être réglée proportionnellement à la vigueur du malade. De plus, on la buvait contre des morsures de serpents et pour assurer l'insensibilité avant des opérations; l'odeur en suffisait à quelqu'uns pour produire le sommeil.¹ Théophraste² dit qu'elle induit en sommeil, mais que donnée en plus grande quantité, elle est mortelle (οἱ δ'ὑπνωτικοὶ πλείους δὲ δίδόμενοι καὶ θανατηφόροι καθάπερ ὁ μανδραγόρας). D'après Celsus (III, 18), les anciens avaient l'habitude de mettre le fruit de la plante sous leurs oreillers pour hâter le sommeil.

Hermès, cité par Ibn al-Baitār, dit que c'est une plante bénie entre toutes et qu'elle est utile contre toutes les maladies qui affligent l'homme par le fait des génies, des démons (cf. Josèphe) et de Satan. Elle est salutaire aussi contre les graves affections internes, telles que la paralysie, le tic nerveux, l'épilepsie, l'éléphantiasis, l'aliénation mentale, les convulsions et la perte de la mémoire.³

Le vin mentionné par Çou Mi et Dioscoride, dans lequel on a fait infuser des racines de mandragores s'appelait mandragorite (Littre). En italien c'est *mandrayolato*. L'usage de ce terme remonte jusqu'à Dioscoride (V, 81: ὁ μανδραγορίτης οἶνος). Théophraste⁴ a déjà fait observer que la racine est administrée dans du vin ou du vinaigre (διδόσσι δ'ἐν οἴνω ἢ ὄξει). Le médecin Galène (131—204) fait remarquer que l'extrait de mandragore, aussi bien que le vin qu'il servait à préparer, étaient chaque an apportés de Crète à Rome. Ajoutons le texte de l'évêque Isidore (Isidorus Hispalensis, ca. 570—636), inséré dans ses *Originum sive etymologiarum libri XX* (XVII, 9): "Maudragora dicta, quod habeat mala suaveolentia in

¹ Vis somnifica pro viribus bibentium; media potio cyathi unius. Bibitur et contra serpentes et ante sectiones punctionesque, ne sentiantur; ub haec satis est aliquis somnum odore quoesisse (XXV, 94, § 150).

² *De causis plantarum*, VI, 5.

³ L. Leclerc, *Traité des simples*, II, p. 246.

⁴ *Historia plantarum*, IX, 9, 1.

magnitudinem mali Martiani; unde et eam Latini malum terrae vocant. Hanc poetae ἀνθρωπόμορφον appellant, quod habeat radicem formam hominis simulantem. Ἄνθρωπος enim graeco, latine dicitur homo. Cuius cortex vino mixtus ad bibendum datur iis quorum corpus propter curam secandum est, ut soporati dolorem non sentiant. Huius species duae: foemina, foliis lactucae similibus, mala generans in similitudinem prunorum; masculus vero folia betae similia habet.”¹

Nous devons tourner maintenant vers une autre idée attachée à la mandragore, qui ne se trouve pas chez Cou Mi, mais qui se manifeste dans un autre groupe de traditions chinoises. Maimonides (1135—1204) dit à propos du livre *L'Agriculture des Nabatéens*² que Adam dans son livre fit mention d'un arbre dans l'Inde, les branches duquel rampent comme un serpent, quand on les jette sur terre; et, de même, d'un autre arbre, la racine duquel a la forme d'un homme et une haute voix et prononce des paroles intelligibles.³

Nous lisons dans la matière médicale d'Ibn-al-Baitar (1197—1248) sur la plante *luf* لوف (*Arum dracunculus*): “Il y en a trois espèces. L'une s'appelle en grec *dracontion*, ce qui veut dire *arum serpenteire*, الحية, à cause que sa tige tachetée ressemble à une peau de serpent. C'est l'arum long, مستطيل, le grand arum, لوف كبير. Nos compatriotes en Espagne lui donnent le nom de *gargantia* غرغنتية. D'autres l'appellent *sarrākha* صرّاخه, parce qu'ils prétendent qu'elle jette un cri, *sarkha*, que l'on entend le jour du Mihrijān, c'est-à-dire

¹ L'idée que la mandragore hâte la propagation émane pour la première fois du Physiologus (chap. XIX), où la plante est localisée près du paradis, étant cherchée et mangée par les éléphants avant de s'accoupler. Je ne poursuis pas cette piste ici, parce que cette notion ne joue pas de rôle dans la tradition chinoise.

² Cf. E. Renan, *An Essay on the Age and Antiquity of the Book of Nabatæan Agriculture* (London, 1862); A. v. Gutschmid, *ZDMG*, XV, p. 1, et Nöldeke, *ibid.*, XXIX, p. 445. On sait que ce livre (*Falāḥa nabafiya*) qui prétend d'être une traduction arabe d'une ancienne source nabatéenne est une forgerie du dixième siècle.

³ D. Chwolson, *Sabier*, II, p. 458.

le jour de la Pentecôte, et, de plus, que celui qui l'entend mourra dans l'année." ¹ La même observation est aussi faite par Ibn el-'Awwām de Séville, qui écrivit dans la première moitié du VI^e siècle de l'hégire le *Kitāb el-falāha* (Livre de l'agriculture). ² L'analogie de ce cas avec la mandragore est frappante, et il s'agirait de savoir si le trait de la plante qui pousse un cri et cause la mort d'un homme était à l'origine propre à l'arum, c'est-à-dire, appartenait à un autre cycle de traditions, et a passé de là à la mandragore, ou inversement. En tout cas cette notion légendaire paraît bien être d'origine orientale. Autant que je sache, Maimonides ou plutôt l'œuvre apocryphe qu'il cite présente la source la plus ancienne qui contienne la combinaison de cette attribution avec la mandragore. Dès ce temps-là ce motif ne tarda pas d'être vulgarisé: le cri poussé par la racine de la mandragore au moment qu'elle est arrachée au sol devient fatal à l'auditeur. Le plus fameux passage de ce genre se trouve dans Shakespeare, *Romeo and Juliet* (IV. 3, 47):

And shrieks, like mandrake's torn out of the earth,
That living mortals, hearing them, run mad.

Dans *King Henry VI* (II. 3, 2) Suffolk dit à la reine:

Would curses kill: as doth the mandrake's groan. ³

¹ L. Leclerc, *Traité des simples*, III, p. 248.

² C. Huart, *Littérature arabe*, p. 313. L'ouvrage d'Ibn el-'Awwām a été traduit en français par J.-J. Clément-Mullet (*Ibn al Awwām, livre de l'agriculture*, 2 vols., Paris, 1864—1867). Malheureusement je n'ai pas accès à cette traduction; j'ai tiré le fait en question de I. Iōw, *Aramäische Pflanzennamen*, p. 239.

³ Dans plusieurs autres passages, Shakespeare fait allusion à la mandragore.

Not Poppy, nor Mandragora,
Nor all the drowsie Syrrups of the world
Shall ever medicine thee to that sweet sleep
Which thou owedst yesterday.

Othello, III. 3, 330.

Give me to drink mandragora...
That I might sleep out this great gap of time.

Anthony and Cleopatra, I. 5.

Dans *King Henry IV* (II. 1, 2), Falstaff appelle son petit page "whoreson mandrake"; le

Mais hâtons-nous d'ajouter que cette tradition est strictement médiévale. C'est par inadvertence que G. E. Post¹ fait observer, "The ancients also believed that this root gave a demoniacal shriek as it was pulled up." Il n'en est rien: rien de pareil dans aucun document de l'antiquité.

Cette idée bizarre, d'où vient-elle? Nous avons vu que Cou Mi compara la mandragore avec le ginseng (*Panax ginseng*), fameuse panacée de sa patrie. D'autre part, le nouveau dictionnaire anglais d'Oxford régitre le terme "Chinese mandragoras" au sens de ginseng, et le dictionnaire persan-anglais de Steingass donne cette définition de l'expression *mardum-giyā* مردم گيا: "a plant, the produce of China, said to resemble a man and woman, and to which many wonderful effects are attributed; mandrake, colocynth." De cette manière, le mot persan désigne la mandragore aussi bien que le ginseng d'origine chinoise. C'était le P. Martini (1655) qui rapprocha le dernier à la mandragore: "Je ne sçaurois mieux représenter cette racine qu'en disant qu'elle est presque semblable à nostre Mandragore; hormis que celle-là est un peu plus petite quoyqu'elle soit de quelcune de ses especes. Pour moy je ne doute point du tout, qu'elle n'ayt ces mesmes qualités et une pareille vertu; puisqu'elle luy ressemble si fort et qu'elles ont toutes deux la mesme figure" [suit une assez longue description de la racine et de ses propriétés].² De même

judge Shallow recevait dans sa jeunesse le sobriquet "mandrake" ("when he was naked, he was...like a forked radish with a head fantastically carved upon it with a knife"; *ibid.*, III. 2). Enfin le passage dans *Macbeth* (I. 3, 84)

Or have we eaten of the insane root
That takes the reason prisoner?

paraît contenir une allusion à la mandragore.

¹ Dans le *Dictionary of the Bible* de J. Hastings, III, p. 234.

² A. Kircher, *La Chine illustrée*, p. 241 (Amsterdam, 1670). On voit ainsi que le ginseng était connu en Europe au XVII^e siècle. Je ne m'arrête pas à cette matière sur laquelle tant a été écrit. Il suffit de renvoyer le lecteur à Bretschneider, *Botanicon sinicum* 3^e partie, no. 3; Du Halde, *Description de l'empire de la Chine*, II, p. 150 (ce mémoire est dû au P. Jartoux); *Mémoires concernant les Chinois*, II, p. 428; et voir la bibliographie

que la mandragore, le ginseng est anthropomorphisé et doué de langage par les Chinois. L'ouvrage ancien *Pie lu* 別錄 dit que sa racine est comme la figure de l'homme et a des qualités divines (根如人形者有神); et le *Wu pu p'en ts'ao* 吳普本草, écrit au troisième siècle, attribue à la racine des mains, des pieds et des yeux, tout comme chez l'homme, et la range parmi les choses spirituelles (根有手足而目如人者神).¹ Ensuite le ginseng est capable de crier. Le document le plus ancien à cet égard qui me soit connu est contenu dans les Annales de la dynastie Soui, où nous lisons: "Au temps de Kao Tsu (ou Wen Ti, 590—604)

dans H. Cordier, *Bibliotheca sinica*, col. 2969, 3035—6. — L'observation du P. Martini fut relevée par J. F. Lafitau (*Mémoire présenté à son altesse royale Monseigneur le Duc d'Orléans, regent du royaume de France; concernant la précieuse plante du ginseng de Tartarie, découverte en Canada*, 88 p., petit 8°, Paris, chez J. Monge', 1718), missionnaire Jésuite parmi les Iroquois, qui, après avoir lu le mémoire de Jartoux sur le ginseng chinois, découvrit une semblable espèce au Canada. Il dit (p. 71): "Quand j'eus découvert le ginseng, il me vint en pensée que ce pouvoit être une espèce de mandragore. J'eus le plaisir de voir que je m'étois rencontré sur cela avec le Père Martini, qui dans l'endroit que j'ai cité, et qui est rapporté par le Père Kirker [sic], parle en ces termes. Je ne saurois mieux représenter cette racine, qu'en disant qu'elle est presque semblable à notre mandragore, hormis que celle-là est un peu plus petite, quoi qu'elle soit de quelqu'une de ses espèces. Pour moi, ajoute-t-il, je ne doute point du tout qu'elle n'ait les mêmes qualités et une pareille vertu, puisqu'elle lui ressemble si fort, et qu'elles ont toutes deux la même figure." Lafitau a raison dans sa critique qui suit: "Si le Père Martini a eu raison de l'appeller une espèce de mandragore à cause de sa figure, il a eu tort de l'appeller ainsi à cause de ses propriétés. Nos espèces de mandragore sont narcotiques, rafraîchissantes, et stupéfiantes. Ces qualités ne conviennent point du tout au ginseng." Alors Lafitau s'efforce de démontrer que la mandragore des anciens n'est pas identique à notre mandragore d'aujourd'hui. Une autre curiosité de l'opuscule de Lafitau c'est qu'il rapproche le nom iroquois du ginseng canadien, *garent oguen* (qu'on dit signifier "cuisses, jambes" + "deux choses séparées") au mot chinois traduit par lui "ressemblance de l'homme". Il en conclut que "la même signification n'avoit pu être appliquée au mot Chinois et au mot Iroquois sans une communication d'idées, et par conséquent de personnes. Par là je fus confirmé dans l'opinion que j'avois déjà, et qui est fondée sur d'autres préjugés que l'Amérique ne faisoit qu'un même continent avec l'Asie, à qui elle s'unit par la Tartarie au nord de la Chine." Tout cela est excusable et intelligible, eu égard à l'état de la science au temps où vivait l'auteur.

¹ Je ne crois pas que la traduction de Bretschneider ("has hands, feet, a face and eyes like a man possessed of a god") soit correcte; le mot 神 ne se rapporte qu'à la racine même.

il y eut un homme à Šan-tań¹ derrière la maison duquel on entendait chaque nuit la voix d'un homme. On le cherchait, mais sans le trouver. En s'écartant un *li* de la maison, tout ce qu'on aperçut fut une plante de ginseng avec les branches et les feuilles hautes et bien développées. On la déracina et on trouva que la racine avait plus de cinq pieds de long, et que toute sa forme imitait le corps d'un homme. Depuis ce moment les cris cessèrent." ² A en croire le *P'ei wen čai kwan k'ün fan p'u* 佩文齋廣羣芳譜 (chap. 93, p. 5 b) il y a encore un texte plus ancien à relever ce trait, le *I yūan* 異苑, attribué à Liu King-šū 劉敬叔 du cinquième siècle; mais n'ayant pas à ma disposition une édition de cet ouvrage, je laisse de côté la question chronologique. Liu Kiń-šū dit: "Anciennement il y eut un homme qui, en fouillant le sol, y introduisit sa bêche. Puis il entendit dans la terre des soupirs, et en recherchant le son, obtint de fait un ginseng." ³ Rappelons aussi le fait que les Chinois se servent de ginseng comme aphrodisiaque.

Ces coïncidences étant constatées, les ressemblances entre les traditions de la mandragore et du ginseng sont épuisées, et les différences, au contraire, sont plus nombreuses et plus fondamentales. Le ginseng n'est pas une plante vénéneuse, elle rétablit la vie et ne donne jamais la mort comme la mandragore. Il n'est pas dangereux ou fatal de recueillir du ginseng qui n'est point devenu objet de magie. Son cri paraît comme un développement logique

¹ La partie du Šan-si sud-est, toujours fameuse pour son excellent ginseng.

² 高祖時上黨有人宅後每夜有人呼聲。求之不得。去宅一里所但見人參一本。枝葉峻茂。因掘去之。其根五尺餘。具體人狀。呼聲遂絕。 — *Sui šu*, chap. 32, p. 1. Le *Pen ts'ao kan mu* (chap. 13 A, p. 4 b) a tire le même texte du *Kwan wu hsiń ki* 廣五行記, ouvrage du temps des Song.

³ 昔有人掘之始下鐮便聞土中呻吟聲尋音而取果得人參。

de sa caractéristique anthropomorphe, et qui plus est, n'envoie pas un homme à la tombe. En effet, les Chinois n'ont rien emprunté de cela aux peuples occidentaux; une telle théorie se heurterait sérieusement contre la chronologie. L'anthropomorphisme et la faculté de parler du ginseng sont d'une date plus ancienne en Chine que les notions analogues de la mandragore à l'ouest; et selon toute apparence, la connaissance de la mandragore n'y est pas arrivée avant l'époque des Song. Mais s'il est vrai que le ginseng était un objet de commerce de la Chine à la Perse, la question se pose si le cri de la mandragore qui fait son début au moyen âge n'est pas le résultat direct des contes chinois concernant le ginseng.¹

Le fait rapporté par Čou Mi que des racines de mandragore étaient importées en Chine aux temps des Song et effectivement employées n'est pas moins intéressant. Cependant il est frappant que ni Čou K'ü-fei ni Čao Žu-kwa ne paraissent connaître ce commerce.²

Mais Čou K'ü-fei 周去非 nous a laissé une anecdote sur une autre plante apparentée à la mandragore quant à la composition et à l'effet de son poison et qui pour cela ne manque pas de piquer notre curiosité. Aussi nous donnera-t-elle occasion de formuler

¹ Il y a d'autres plantes les racines desquelles sont conçues par les Chinois comme anthropomorphes, par exemple, *Phytolacca acinosa*, *lan lu* 商陸 (cf. Bretschneider, *Chinese Recorder*, III, 1871, p. 219; *Bot. sin.*, II, no. 112, III, no. 131), décrite par le *Pie lu* avec les mêmes expressions que le ginseng (如人形者有神) et appelée aussi *ye hu* 夜呼 ("criant de nuit"). Mais le *Pen ts'ao kan mu* ne contient pas de texte qui fasse allusion à la faculté de crier qu'aurait la racine. Minakata (voir *supra*) ne donne à cet effet qu'un texte écrit en 1610, le *Wu tsu tsu* 五雜俎.

² La plante *lan-tu* 狼毒 a été identifiée avec une mandragore par Bretschneider (*Bot. sin.*, III, no. 132), qui fonda cette opinion sur un dessin japonais, mais Stuart (*Chinese Materia Medica*, p. 257) regarde cette identification comme douteuse et la description dans les sources chinoises comme insuffisante; à l'avis du même auteur (p. 58) il est douteux aussi que le genre *Atropa* se trouve en Chine. Forbes et Hemaley (*Journal Linnean Society*, XXVI, p. 175) enregistrent une *Mandragora caulescens* au Yun-nan d'après Franchet (*Bull. Soc. Bot. de France*, XXXII, p. 26). Quoi qu'il en soit, il est certain qu'aucune mandragore n'est connue à la pharmacopée chinoise.

quelque conclusion à propos du nom *mandragore* lui-même. Dans son *Lín wai tai ta* 嶺外代荅, écrit en 1178, l'auteur chinois rapporte ainsi: "La fleur *man-t'o-lo* de la province de Kwang-si croît partout dans l'état sauvage. Ses feuilles sont larges, les fleurs blanches, et la formation des fruits est comme chez l'aubergine ou la melongène (*Solanum melongena*). Elle forme partout des petits piquants, et c'est une plante qui sert de remède aux hommes.¹ Des voleurs cueillent la plante, la sèchent et broient. Ils la placent de manière que des hommes la boivent ou mangent; et en ce cas ils en deviennent ivres. Pendant qu'ils sont dans cet état de torpeur, les brigands enlèvent leurs cassettes et prennent la fuite. Les hommes au midi de la Chine se servent de ce remède aussi pour les petits enfants et en amassent de grandes quantités."²

Le nom *man-t'o-lo* 曼陀羅 est contenu dans le *Fan yi miñ i tai* (chap. 8, p. 6) et équivaut au sanskrit *mandara*, *mandāra*, *mandāraka*.³ Il est assez étonnant qu'une plante non-cultivée, qui d'après Li Ši-čen croît aussi au nord de la Chine, soit appelée d'un terme sanskrit. Elle n'apparaît pas dans les documents avant l'époque des Song,⁴

¹ Le mot 藥 a ici la fonction verbale. Cf. 益人草 "une herbe qui fait du bien à l'homme"; 毒人草 "une herbe qui empoisonne l'homme".

² 廣西曼陀羅花徧生原野大葉白花結實如茄子而徧生小刺乃藥人草也。盜賊採乾而末之以置人飲食使之。醉悶則挈篋而趨。南人或用爲小兒食藥去積甚峻。 — *Lín wai tai ta*, chap. 8, p. 14 b; éd. du *Ci pu tou tai ts'ün ju*.

³ Voir aussi Eitel, *Handbook of Chinese Buddhism*, p. 94.

⁴ Du moins pas de texte d'une date plus ancienne m'est-il connu. Le *T'u lu tai t'ou* (section botanique, chap. 124), sous le titre *man-t'o-lo*, ne fait que citer la notice du *Pen ts'ao kan men*, puis une brève remarque de Č'en Yü-i 陳與義 des Song, un conte tiré du *T'an Yüan* 談苑 par Yan I 楊億, qui vécut au commencement de l'onzième siècle et collabora au *Ts'e fu yüan kwei*, et une note très courte du *Lo yan hwa mu ki* 洛陽花木記 ("Mémoires des plantes de Lo-yan"), écrit par Čou Sū 周叙 dans la seconde moitié de l'onzième siècle. Le texte le plus important du *Lín wai tai ta*

et pour cela est suspecte d'avoir été importée de l'Inde, quoique le fait d'une telle importation ne soit pas relevé par les textes. La plante se rapporte au genre *Datura*, mais il n'est pas certain si c'est l'espèce *alba* ou *stramonium*.¹ C'est une solanée comme la

y est omis. Le *T'u lu ts'i t'ou* contient aussi un dessin de la plante. C'en Hao-tse 陳
 湨子, dans son *Pi fu hwa kin* 秘傳花鏡 (chap. 5, p. 37 b) de l'an 1688, décrit le *man-t'o-lo* comme une fleur du nord de la Chine et dit que le nom est sanskrit.

¹ Stuart, *Chinese Materia Medica*, p. 145—147. "Le *Datura stramonium*, ou Pomme épineuse [anglais *thorn-apple*], appelé aussi stramoine, endormie, herbe aux sorciers, herbe aux diables, croît communément en France, mais il se rencontre également dans presque toutes les parties du monde, à l'exception de l'Australie; on pense qu'il est originaire de l'Amérique et qu'il s'est propagé de là en Europe. Cependant on le trouve depuis des siècles, en France, en Grèce, dans la région caucasique, dans la Syrie" (A. Milne Edwards, *De la famille des solanacées*, p. 87, Paris, 1864). — Les auteurs chinois de l'*English and Chinese Standard Dictionary* étaient conduits par un sentiment juste, en se servant du mot *man-t'o-lo* pour traduire l'anglais *mandrake*. S. Couvreur (*Dictionnaire français-chinois*, p. 369) donne deux termes *su-hwa* pour *Datura*: *lan ma-tse* 山麻子 ("chanvre sauvage") et *la-pa hwa* 喇叭花 ("fleur à trompette"). Le *datura* est connu aux Chams sous le nom *salak* et aux Khmers sous le nom *slak* (Aymonier et Cabaton, *Dictionnaire cham-français*, p. 491). Notre mot *datura* est ramené au sanskrit *dhattūra* par Yule (*Hobson-Jobson*, p. 298); Hindī et Hindustānī *dhatūra*, persan *dātūra* داتوره. La mention la plus ancienne du *datura* qui me soit connue dans la littérature européenne vient de Pierre Belon du Mans, qui dit dans son œuvre *Les Observations de plusieurs singularités et choses memorables, trouvées en Grece, Asie, Indée, etc.*, fol. 369 (Anvers, 1555) [cf. *T'oung Pao*, 1916, p. 362]: "Les Turcs ont des merueilleuses experiences de plusieurs choses, comme pour faire dormir soudainement. Voudroit on chose plus singulière que de trouver drogue pour faire incontinent dormir qu'elqu'un qui ne peut reposer? Ils vont chez un droguiste (car ils n'ont point d'Apoticaire) auquel demandent pour demie aspre de la semence de Tatoula. Puis la baillent à celui qui ne peut dormir. Tatoula n'est autre chose que ce que les Arabes appellent Nux metel, et les Greca Solanum somniferum: de laquelle nous en trouuames de sauuage en la plaine de Iericho, près la fontaine d'Helisee." Le mot *tatoula* est Osmanli *dadula* طاطولة (néo-grec *τάτουλας*), évidemment dérivé du persan. Cette forme du nom n'est pas notée par Littré qui ne donne que *datura* et le dérive de l'arabe *datora* et du persan *tatula*, en ajoutant "du radical *tal*, piquer, par allusion à l'enveloppe épineuse du fruit." Vu le mot sanskrit, cette étymologie semble être caduque. Christoual Acosta (*Tractado delas drogas y medicinas de las Indias Orientales*, p. 87, Burgos, 1576) s'exprime ainsi: "Lhamase esta planta en el Malabar, Vnmeta [Sanskrit *unmatta*] caya: en Canarin, Datyro: los Arabes, Nux Methel, y Marana: los Portugueses, Datura, y la Burladora: los Parsios, y Turcos, Datula: los medicos Indianos graduan esta planta fria, en el grado tercero, y seca en el fin del segundo." Acosta donne une gravure de la plante et contribue des observations intéressantes sur son emploi dans l'Inde et l'Espagne. Le mot *metel* du terme botanique *Datura metel*, originaire de

mandragore, et comme toutes les solanées, contient l'alcaloïde daturine ou atropine, $C_{17}H_{23}O_3$. L'analogie des contes de Čou Mi et de Čou K'ü-fei, bien qu'ils se rapportent à des plantes différentes, est due à la composition chimique analogue et à la même action des deux poisons. Encore de nos jours, les Chinois ont employé cette substance funeste pour des buts artificieux. Crawford¹ nous informe que *kučubun* (le mot soundanais pour *Datura ferox*)² est donné par les Malais pour produire la plus complète stupeur et "is a powerful engine in the hands of the Chinese for effecting various artifices and tricks in trade." On dit que dans quelques parties de la Chine *Datura alba* s'emploie pour stupéfier et saisir des poissons.³ La désignation propre de la dernière espèce est *nao-yan* 鬧羊; d'autrui identifient ce terme avec *Datura metel*. Les fleurs, digérées dans le vin, servent d'anesthésique et sont indiquées dans la chorée des enfants; on en fait aussi des lotions contre les éruptions de la face, l'enflure des pieds et la chute du rectum.⁴

l'Inde, est dérivé du sanskrit *mātula*, peut-être apparenté à *matta* et *umatta* ("enivré, insensé", et aussi "datura"). Cette espèce est notée par Loureiro (*Flora Cochinchinensis*, p. 135) pour l'Indochine sous le nom *nao yan hwa* 鬧陽花. *Datura ferox* était connu à Linné comme une plante chinoise; elle est commune dans la Chine septentrionale (Bretschneider, *Early European Researches into the Flora of China*, p. 104). Une autre espèce, *Datura meteloides*, connue en Amérique, est employée par les Indiens Zufi et Mohave (M. C. Stevenson, *Ethnobotany of the Zufi Indians, Thirteenth Annual Report Bureau of American Ethnology*, 1908—09, p. 46; W. E. Safford, *Proceedings of the Nineteenth Internat. Congress of Americanists*, p. 28, Washington, 1917).

¹ *History of the Indian Archipelago*, I, p. 466.

² Javanais *kačubun*, malais *kečubun*. D'après l'*Encyclopedie van Nederlandsch-Indië* (II, p. 204) ce mot se rapporterait au *Datura alba*.

³ C. Ford, *Flora of Hainan (China Review, XX, p. 161)*. Le même auteur fait remarquer que cette plante s'appelle à Hoihow *mui-twa-lo* 門山羅, évidemment une tentative dialectale de reproduire le mot étranger *man-t'o-lo*. Forbes et Hemsley (*Journal Linnean Society*, XXVI, p. 175) disent que *Datura alba* se trouve dans la Chine méridionale et à Formose, et est cultivée à Peking.

⁴ J. L. Soubeiran et Dabry de Thiersant, *La Matière médicale chez les Chinois*, p. 190 (Paris, 1874). Dans *An Epitome of the Reports of the Medical Officers to the Chinese Imperial Maritime Customs Service, from 1871 to 1882*, compilé par C. A. Gordon

E. Perrot et P. Hurrier,¹ deux pharmaciens français qui ajoutent à la nomenclature chinoise le nom japonais *mondarague*, donnent les renseignements suivants: "Les grains de ce *Datura*, irrégulièrement triangulaires et dont la forme a été comparée à celle de l'oreille humaine, sont d'un brun jaunâtre clair, rugueuses, déprimées au centre. Dans l'Inde, elles servent à préparer un extrait et une teinture très estimés comme narcotiques et sédatifs. Les feuilles s'emploient topiquement comme calmantes. Les fleurs, digérées dans le vin, jouissent d'une grande réputation dans l'épilepsie et l'hydropisie." En effet, plusieurs espèces de *Datura* (*fastuosa*, *metel*, et *stramonium*) croissent dans l'Inde.²

C'est dans l'Inde que nous rencontrons aussi le prototype des brigands de Çou K'ü-fei. Nous savons par Garcia da Orta (1563) que les thugs indiens mettaient cette drogue dans la nourriture de leurs victimes, et que l'effet en durait vingt-quatre heures; ceux qui prennent cette médecine perdent leurs sens, rient toujours et sont très généreux, car ils laissent les gens enlever quelconque joaillerie qu'ils choisissent, et ne font que rire ou parlent très peu, et seulement des absurdités.³ Les cas d'empoisonnement avec le *Datura* sont encore très fréquents dans l'Inde. Mais les fripons

(London, 1884), il est dit (p. 231): "The *datura* or *man-t'o-lo* of the Buddhist classics is foreign to China, having, it is said, been introduced from India. When eaten, unconscious laughter is set up, and the person acts as if intoxicated. It may be used as an anæsthetic. It is used in infusion to wash the feet; it is also applied to ulcers of the face, in convulsions of children, and in *prolapsus ani*." Voir aussi G. A. Stuart, *Chinese Materia Medica*, p. 145—147.

¹ *Matière médicale et pharmacopées sino-annamites*, p. 174 (Paris, 1907).

² W. Ainslee, *Materia Indica*, I, p. 442—446 (London, 1826); W. Roxburgh, *Flora Indica*, p. 188; G. Watt, *Commercial Products of India*, p. 487—489; Flückiger et Hanbury, *Pharmacographia*, p. 459—463. *Datura alba* est indigène dans l'Inde; il n'est pas certain si ceci est le cas pour *Datura stramonium* (A. de Candolle, *Géographie botanique*, II, p. 731). Toutefois cette espèce se trouve dans l'état sauvage à l'Himalaya de Kachmir à Sikkim.

³ C. Markham, *Colloquies on the Simples and Drugs of India by Garcia da Orta*, p. 175.

chinois et indiens qui apparaissent si modernes et civilisés dans leurs méthodes et assez congéniaux à nos *chloroform burglars* ne peuvent se vanter d'une grande originalité. La ruse est vieille, hors que les anciens préparaient l'extrait non du *Datura*, mais de la mandragore; c'est toute la même chose. Frontin qui vécut sous les règnes de Vespasien et de ses fils, et mourut dans les premières années du règne de Trajan, raconte dans ses *Stratagèmes* l'anecdote suivante: "Maharbal, envoyé par Carthage contre les Africains révoltés, sachant cette nation très-portée pour le vin, en fit mêler une grande quantité avec de la mandragore, substance qui tient le milieu entre un poison et un soporifique; puis, après une escarmouche, il se retira. Vers le milieu de la nuit il fit semblant de prendre la fuite, laissant quelque bagage et tout le vin empoisonné. L'ennemi se jeta dans le camp; et là, dans la joie de la victoire, ayant bu avec excès de cette mixtion, tandis qu'ils étaient étendus par terre comme des corps morts, Maharbal revint sur ses pas, et en fit un grand massacre".¹ Polyen (Polyainos) de la Macédoine, qui vécut à Rome sous les règnes de Marc Aurel et L. Verus, dit dans son *Strategika* (VIII, chap. XXIII, 1) que le jeune César, en voyage pour l'Orient, tomba dans les mains de pirates ciliciens pas loin du cap Malea. Il fit venir la rançon demandée de Milet et au même temps un pot rempli d'épées et une quantité de vin empoisonné avec de la mandragore. Il en régala les pirates et ordonna qu'ils fussent massacrés dans leur assoupissement. Dans un autre passage du même ouvrage (V, chap. X, 1) Polyen rapporte un conte sem-

¹ Maharbal, missus a Carthaginensibus adversus Afros rebellantes, quum sciret, gentem avidam esse vini, magnum eius modum mandragora permiscuit, cuius inter venenum ac soporem media vis est. Tunc, proelio levi commisso, ex industria cessit: nocte deinde intempesta, relictis intra castra quibusdam sarcinis, et omni vino infecto, fugam simulavit: quumque barbari occupatis castris, in gaudium effusi, medicatum avide merum hausissent, et in modum defunctorum atrati jacerent, reversus aut cepit eos, aut trucidavit (*Strategematicon* II, chap. V, 12). J'ai reproduit la traduction de Th. Baudement dans l'édition d'*Amien Marcellin, Jornandès, Frontin, etc.*, par M. Nisard, p. 536 (Paris, 1851).

blable à celui de Frontin à propos du général carthaginien Himilco.

Mais retournons à l'Inde. La connaissance du *dhattūra* y remonte à une époque reculée, car la plante est plusieurs fois mentionnée par Suçruta. Je dois à l'obligeance du Dr. A. F. R. Hoernle d'Oxford les renseignements suivants :

"There are the following references to *dhattūra* in the text-book of Suçruta:—

1. *Cikitsāsthāna*, ch. XVII, verse 35, p. 435 (JivInanda, 5th ed.), where pounded seeds of *dhattūra* and other drugs (*madana*, *kodrava*, etc.) are recommended in the treatment of a sinus (*nāḍi*).

2. *Kalpasthāna*, ch. VI, verse 49, p. 589, roots (or, according to others, seeds) of *dhattūra*, made up, with other drugs, into a paste, is recommended as a *çirovirecana* ('clearing of the head') in the case of hydrophobia.

3. *Ibidem*, verses 51, 52, root of *dhattūra*, made, with other drugs, into a paste, wrapped in leaves of *unmattaka* (synonyme of *dhattūra*), and baked into a cake (*apūpaka*), is recommended in the case of bite by a rabid dog.

"In the text-book of Caraka, *dhattūra* does not occur at all. For the occurrence of *dhattūra* in medical text-books and later authors, such as Cakrapānidatta, c. A.D. 1060, and Bhāva Miçra (*Bhāvaprakāṣa*), 16. cent. A.D., see U. C. Dutt's *Materia Medica*, pp. 207—8.

"The Sanskrit word is spelled variously *dhattūra*, *dhuttūra*, *dhūsstūra*, etc.

"You identify *dhattūra* with *Datura stramonium*; but, as you know, our botanical books mention other varieties also. Sanskrit medical text-books distinguish two varieties, black, or rather dark, flowered, and white flowered (see *Mat. Med.*, p. 202); and they have also two names, *dhattūra* and *unmatta* (or *unmattaka*). The former is expressly called *kṛṣṇa-puṣpa*, 'dark-flowered' (see *Rāja Nighaṇṭu*, 10. varga, p. 135), and appears to be the one usually intended to

be used. But *unmatta* seems to be the proper name of the white variety; indicated by a prescription of Cakrapāḍidatta (*Mat. Med.*, p. 207, note 2), where the name *çvetonmatta*, or 'white *dhattūra*' occurs. *D. stramonium* has white flowers, while *D. metel* and *D. fastuosa* have darker flowers. Accordingly the Sanskrit name *dhattūra* would seem to refer to the latter two varieties, while *unmatta* would seem to indicate the variety *D. stramonium*." ¹

¹ Le Dr. T. Tanaka au Bureau of Plant Industry, Department of Agriculture, Washington, a eu l'extrême obligeance de traduire pour moi les renseignements suivants sur *Mandara-kwa* (ou *Mandara-ge* selon la prononciation bouddhiste) 曼陀羅花, contenus dans le *Honzō-kōmoku-keimō* 本草綱目啓蒙 by Ono Ranzan 小野蘭山 (revue par Igači Bōchi 井口望之, 1847, chap. 13, p. 28—29):

Japanese Nomenclature:

In Provinces:

<i>Čōsen-asagao</i> (Korean morning glory).	
<i>Yama-nasubi</i> (mountain egg-plant).	
<i>Namban-asagao</i> (morning glory of the Southern Barbarians).	
<i>Hari-nasubi</i> (spiny egg-plant).	Iyo.
<i>Tō-nasubi</i> (Chinese egg-plant).	Iyo.
<i>Gekwa-korosi</i> (surgeon killer).	Sanuki.
<i>Gekwa-densi</i> (surgeon thrower).	Hōki, Iwami, Iyo.
<i>Tenjiku-nasubi</i> (Indian egg-plant).	Awa.
<i>Iga-nasubi</i> (prickly egg-plant).	Awa.
<i>Gida-sō</i> (meaning uncertain).	Buzen.
<i>Čamera-so</i> (meaning uncertain).	Edo (Tokyo).
<i>Kičigai-nasubi</i> (insane egg-plant).	Iwami.
<i>Awisu</i> (meaning uncertain).	Bingo.
<i>Iga-naru</i> (prickly egg-plant).	Nagato.
<i>Ki-asagao</i> (tree [or yellow?] morning glory).	Simōsa.
<i>Čōsen-tabako</i> (Korean tobacco).	Tōtomi.
<i>Tō-asagao</i> (Chinese morning glory).	
<i>Baramon-sō</i> (herb of the Baramon 波羅門, that is, Brāhmana).	

Chinese synonyms:

quoted from

佛花	<i>Fu Awa</i> ('Buddha's flower').	和幼新書
顛茄	<i>Tien kie</i> .	香山縣志
悶陀羅草	<i>Men t'o lo ts'ao</i> .	名山勝概
天茄彌陀花	<i>T'ien k'ie mi t'o Awa</i> .	花曆百詠

"Spontaneous in the provinces Hōki, Buzen, and Sawō, but not grown in the prefectures

Ainsi l'histoire du genre *Datura* dans l'Inde est assez claire. Quant au mot *mandara*, nous avons noté que les Chinois et les Japonais le rapportent exclusivement au *datura*. En consultant le dictionnaire sanskrit de Boehtlingk, nous trouvons que *mandara*, *mandāra* ou *mandāraka* signifient en premier lieu *Erythrina indica*,¹ l'arbre de corail, un des cinq arbres du ciel d'Indra, appelé aussi *parijāta*, puis une variété blanche de *Calotropis gigantea*, et enfin la pomme épineuse, c'est-à-dire le genre *Datura*. A l'égard de ces identifications, il est évident que le terme *mandara*, quand il est mentionné dans les textes bouddhistes chinois où la plante tombe des cieux comme une pluie au temps où le Bouddha prêche la loi est l'*Erythrina* à l'exclusion du *Datura*.² D'autre part, l'usage du mot *mandara* chez Čou K'ü-fei à l'époque des Song prouve assez bien que dans l'Inde aussi *mandara* servait d'expression pour le *Datura*.

near Kyōto. The seed is planted in the spring. The form of the leaves is like that of the egg-plant (*Solanum melongena*), without spines, green, and alternate. The plant is 2—3 feet high, the way of branching being also similar to that of the egg-plant; it blooms in the summer and autumn. Flower standing in axil of leaves, white, resembling the blossom of the morning glory (*Pharbitis nil*) with elongated tube and united petal. There are five edges on the outer margin of a flower, gradually narrowed into a tube, about 3 sun (1 sun = 1.193 inch) long. Fruit, about 1 sun long, is round and spiny, hence the name *hari-masubi* is derived; it contains flat, brownish-black seeds. The plant dies out in the autumn, and no part of it thrives until next year.

"If one happens to eat the flower and leaves by mistake, a nervous condition of the nature of insanity will be the consequence, but with the removal of the virus which caused the effect, this condition is gradually overcome, the result being a complete cure without leaving any mental disorder."

¹ W. Roxburgh, *Flora Indica*, p. 541.

² Contrairement à ce que Stuart (*Chinese Materia Medica*, p. 145) dit à ce sujet, C'est d'ailleurs Li Ši-čen lui-même qui est responsable pour cette erreur, en introduisant sa notice sur le *man-t'o-lo* avec les mots: "Il est dit dans le *Fa hwa kin* (Saddharma-puṇḍarika-sūtra) qu'au temps où le Buddha prêcha la loi, le ciel fit pleuvoir des fleurs de *man-t'o-lo*." Il ne savait pas que *mandara* se rapporte dans l'Inde à des plantes différentes.

Voici enfin une question que je me demande et que je voudrais proposer aux étudiants des langues indo-européennes pour leur considération: serait-il possible que le terme sanskrit *mandāra* et le terme gréco-latin *mandragora(s)* soient anciennement apparentés et descendent d'une racine commune? L'accord est éclatant, et si c'est un accident, l'accident serait extraordinaire.
