SINO-TIBETAN STUDIES
Selected papers on the art, folklore, history, linguistics and prehistory of sciences in China and Tibet
by
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Collected by HARTMUT WALRAVENS
Preface by LOKESH CHANDRA

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CONTENTS

China
11 The name of China
19 Five newly discovered bas-reliefs of the Han period
29 The discovery of a lost book
Three Tokharian bagatelles
40 1. A Chinese loan-word in Tokharian A
41 2. A Tokharian loan-word in Chinese
44 3. Turman
50 Se-tiao

Prehistory of Science
51 Arabic and Chinese trade in walrus and narwhal ivory
107 Supplementary notes on walrus and narwhal ivory
149 Turquois-mines in Russian Turkestan
150 Optical lenses
210 Burning-lenses in India
212 Vidanga and cubebs
219 Asbestos and salamander: an essay in Chinese and Hellenistic folklore
294 La mandragore
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 turquoise, optical lenses, asbestos, cubebs, odoric, mandragore 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-hbum). 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:lxxx 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 tsuň 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:xlvii 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 estam-
pages 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 LAUPER.

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 Kautiliya 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 Cîna 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 Tsîn (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 Kautiliya 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 (Tsîna) is traceable to the Chinese dynasty of Tsîn which flourished B. C.

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 (Θίναι) is mentioned; Ptolemy (around 150 A.D., Bk. VII, Ch. 5) follows with Sinai (Σίναι), likewise Marcianus of Heraclea (around 350 A.D.); and Kosmas Indikoplinestes (around 545 A.D.), in his Topographia Christiana, speaks of Tzinitza (elsewhere Tzinitza), in which the Persian Cinistăn and the Sauskrit Cinasthâna 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 Pelliot (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 Ni-ma dPal-bzann-po (Dharmasûrya Çribbadra) completed in 1740, shortly before his death, an important historical work known under the abbreviated title Grub-mt’a bsl-kyi me-loñi, “Crystal Mirror of the Siddânta”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’ama-cad-kyi k’uris dañ adod ts’ul ston-pa legs bsdod bsl-kyi me-loñi, “Source-book (k’uris = Skr. âkara) of all Siddhânta and crystal mirror of fine sayings (Skr. sudhâshita sphâskâdarsâna) 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. shēn t‘u 帝, 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, maha 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 Tsaina, whence the Sanskrit designation Maha Tsina (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.
3) L. c., p. 99.
4) Frequent designation of China in Buddhist literature.
5) Tib. Lou ap‘ing gshen, 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 Cinya 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, Léon'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 preexistence. 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 (Cīnasthāna ¹), and in the attempt to trans-

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 Cîna, 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 Cîna. Whether, as M. Pelliot 1) 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 Cîna 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 involved 3).

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

3) Toung 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 Mahabharata, 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 Kojiki (712) and Nihongi (720) speak of China as the land of T'ang, and the Tahgač of the Turkish inscriptions denoting China seems to be derived from the name of T'ang (Hunnu, 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 "ear 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 *C'ina* 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 *C'ina* 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


16
of Ta’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. Pelliot\(^1\), 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 Sinai and finally ending in our word China spread along the maritime route of the Indian Ocean, in opposition to the names Sēres and Sērike 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 Goēś 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 Sinai 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-ngan 1). 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.

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 CHAVANES' 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 (LAUFER, Chinese Grave-Sculptures, p. 24, and Mission, No. 122 and 148).
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 boatsmen 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; Lauper, 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 Lauper, 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-
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 Chavannes, 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 Chavannes 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 ch'ih t'u* "Illustrations of Husbandry and Weaving" is well known in its outline. This work contains a series of forty-five wood-engravings 1) 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 Ts'oung Pao, 1905, p. 398) states that there are forty-six engravings, in agreement with the Kuo ch'iao hua chéng 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 No. 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 Shen 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 ts' u shi*, published in 1210 by a certain Lou Shou 樂州. 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. 263b 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. 170–171. It will be a matter of justice to emphasize that it is the Chinese author Chang Kēng 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’iao hua ch’êng lu 國朝畫徵録 (Ch. II, p. 7) published in 1739 in 3 vols. by Chang Kēng 張庚 from Siu-shui 秀水 in Kiu-hing fu, Chekiang. 焦秉貞遼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毫毛蓋西洋法也。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聖錦賞甚厚旋鏗板印。

白苧村桑者日。明時有楊瑤者西極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為天主像神氣圓滿彩色鮮麗可愛嘗曰中國祇能畫陽而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梢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 library). Making a flying book-hunting trip to Tokyo, 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 Shou). 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'êng chih t'êu, 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'êu shu tai chêng, T'êe fu yüan kuai etc., and abound in first editions and early prints of the Sung, Yuan 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, dated at the end 1462 天順六年 and written by Wang Ts'éng-yü 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 楼杓. 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 (Empo) 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-kiang 1). 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

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1) K'in t'ing se hu (t'ian 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-chêu 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'ua 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°. 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-san fu, 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 Tang 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-true 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, le 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 Lèng 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 \( \textit{r} \), with short or long vowel, capable of forming a plural \( \textit{r}i- \). The word was pointed out by the first decipherers of the language, E. SIEG and W. SIGLING. ¹ EMIL SMITH, in his very interesting analysis of the Tokharian vocabulary, ² has justly observed that the word \( \textit{r} \) 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 Indosktythen (S.B.A.W., 1908, p. 923). I do not agree with these authors in regarding the language as that of the Indo-Celtians, but side with the conservative views expressed on the subject by A. MEILLET (Le Tokharian, Indo-germ. Jahrbuch, Vol. 1, 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 Uighur 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 Buddhistic 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 Tukhāra (Tibetan T'o-gar; with popular etymology also T'o-dkar; \( \textit{d} \)kar, "white"), — viz., Ghoshaka; the Vaibhāṣika teacher Vāmana (Tibetan Miu-t'ui, "dwarf," mentioned also in d'Pay bsam ljon bzū, p. 88); the ācārya Vībhāgyavāda; and Dharmamitra, a teacher of the Viśāyana (pp. 61, 78, 192 of the translation of Schiefner), — and he twice refers to the Buddhism of Tukhāra (ibid., pp. 38, 282). According to the Index of the Kanjar (ed. I. J. SCHMIDT, p. 78, No. 513), the original text of the Ārya-pralītya-samutpāda-hridaya-vākī-dhārānī, from which the Tibetan translation was made, had been procured from Tukhāra by the Bhikṣu Ner-ban (Nirvāna?)-rakṣita.

² "Tocharisch" die neuentdeckte indoegerm. Sprache Mittelalpinen (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 Tang History relates that the inhabitants of Tibet roam about tending their herds, without having fixed settlements, while there are but a few walled places.

The Tibetan designation for a settlement of any size, though it consist of a single or several habitations, is *groi* (written language also *groi-* or *groi-*) 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, "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."


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

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3. Hirth and Rockhill, Chau Ju-kua, p. 225. The same text is also in Pei shì.
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 hingu is handed down in the Chinese transcriptions hing-kū (*hing-gū) 薰翟, hing-yū (hing-ሮ) 形虞, and hún-kū (*hūn-gū) 薰渠,1 and Persian angula(d) or अंगुल, in Chinese a-yū (�üe) (*a-nū-zi) 阿虞(截).2 Watters says with reference to the Pēn ts'ao kung mu that a-wei is wrongly given as the Brahman or Sanskrit name. This statement, however, is not made by Li Shi-chên, the author of the Pēn ts'ao (Ch. 34, p. 21). Whereas he expressly notes that a-yū is a Persian term, and that hing-yū 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 Pēn ts'ao of the Tang 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 央置, not mentioned by Hirth or Watters. The Nirvāṇasūtra (Yen p'au kung 涯槃經) 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 aiṅkuna, first pointed out in the plural form aiṅkwāz by M. S. Lévi from one of the documents of


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

3 This word is not listed in the Mongol dictionaries of Kovalevski and Golstunski.

It is nothing but a transcription of Ghazni or Ghazna 鄺悉那, the capital of Zābulinā (Chavannes, Documents, p. 160), which, according to Huau Tsang, was the habitat of the plant (Hirth, l. c.). According to I-tsing (Takakusu's translation, p. 128), saafotsida was abundant in the western portion of India.

4 This entire foreign nomenclature is ascribed to a poem of Fan Ch'äng-la 范成 (1126—93) in K'ang-hi's Dictionary (under 馳).
medical contents secured by the Mission Pelliot. 1 The element yan 央, as is known, represents the syllable an in the Chinese transcription of Sanskrit words; for instance, in Aṣālumāya. Kuei 央 is North Chinese, as compared with an older articulation kwai or kyai, as still preserved in Cantonese; so that yang-kuei 央, read in the Tang period an-kwai, is a phonetically exact transcription of a word corresponding to Tokharian aṅkwa. The same holds good for the transcription a-wei: a 阿 answers to Sanskrit a in the method of Buddhist transcriptions; the character uei 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 nūi, also nui. In this manner, also this mode of transcription leads back to Tokharian aṅkwa. 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 (cain it) 映日 and a-yi (a-jil) 阿驛, both answering to a West-Asianic name of the general type anji; 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 阿 served also for the reproduction of the initial syllable an or an in foreign words during the Tang period.

Another Tokharian term of botanical pharmacology is of great interest to us. This is avirāŋ, the designation of the myrobalan Terminalia chebula. 3 First of all, we receive from it a satisfactory clue 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 話黎 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 halilay عليل by T. Watten, 6 and with Aramaic halilag יليل by Hirth. 7 Persian haliluh خليله, also balil and balita, should be added. As the genus

2 J.A.O.S., 1910, p. 20.
3 S. Lévi, l c, p. 123.
7 J.A.O.S., 1910, p. 23.
Terminalia is indigenous to India, however, it is manifest that the West-Asian 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 avirāk demonstrates that the prototype on which the derivations of West-Asian, Chinese, and Tibetan are based, indeed pre-existed somewhere on Indian soil. Chinese -li-lo answers to an ancient articulation -li-tak (ri-rak), and very exactly reproduces Tokharian -virāk. The correctness of this point of view is corroborated by the word पि-li-lo 毛黎勒2 corresponding to Sanskrit vibhītaka and to Tibetan ba-ru-ra (Terminalia belerica). Again in this case the Chinese and Tibetan forms are not actually based on Sanskrit vibhītaka, 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 *vīrīrāk, from which the two were derived, and which corresponded in sense to Sanskrit vibhītaka. The Tokharian term triphal (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,” tūmān or tōmān 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, tuman; usually in the combination tömény-czer, “myriad, many thousands;” tömény-telen, “innumerable”).4 Whereas this word in popular use refers to an indefinite high number, the figure 2, the supposition is

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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, p. 4, pp. 24—36). In Ibn al-Bītār we meet the term “myrobalan of Kabul” (L. Lévi-Krueger, Traité des simples, Vol. I, p. 131); hence our “chebuli” (Yule and Burnell, Hobson-Jobson, p. 136).
2 Pēn ts'au khang nu, Ch. 31, p. 4. It is first mentioned under the T'ang by Su Kung and Li Sūn 李珣.
3 S. Lévi, l. c., p. 126.
4 Compare Z. Gomócz, Die bulgarisch-türkischen Lehnwörter in der ungarischen Sprache, p. 131 (Mémôres de la Société finno-ougrienne, Vol. XXX, Helsingfors, 1912). Gomócz, 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 tuman, as he writes, covered this numerical category. 1 This is confirmed by the Yuan ch'ao pi shi 元朝秘史 (Ch. 12, p. 45, ed. of Li Wen-t'ien 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 numerical "ten thousand" (譯言萬數也) and also an indefinite quantity ( 猃言 罄耳 ). The Niüči vocabulary contained in the Ming edition of the Hua i yi yü likewise transcribes the Niüči 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, Ewinki and Oročen, 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 tumā', and translated it into Russian by "million." 3

Various opinions have been expressed in explanation of the word in question. H. Yule 4 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

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3 This is the cenermost region to which the word has advanced. It is notable that it has been adopted only by Ural-Altaic, but not by any Palæo-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 idāł (from Russian сто) and also the Russian word for "thousand" in the form tibēb (W. Jochelson, Grammar of the Yukaghir Language, p. 115).
4 Hsothow-Johnson, p. 928. Yule (ibid.) has asserted also that tuman or tumān, in the sense of a certain coin or a certain sum of money (in Persia equal to ten sābquānas or coins, 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 [Kadiöf, Nörterbuch, 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.
myō, byō, biō; Mongol miŋgan; Tungusian miŋan) and "ten thousand" (Codex cumanicus tumen; Old Chuvash tūmān; Orkhon inscriptions and Uigur tūmān; Djagatai tūmān トルマ; 1 Osmanli tuman; Mongol tumän [Old Mongol, also tumen); Niitči tuman; Manchu tumen; Tungusian dialects tumō, tumo, tumé, tumen; Gold tuma, tynā). 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. Schott 2 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 тьма and тёмник, yet he thought that the original might perhaps be sought for in Indo-Chinese, pointing to Chinese wan, man ("ten thousand") and ти-ман ("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. Blochert, in a very interesting notice Le nom des Turcs dans l'Avesta, 6 makes an incidental reference to the word tumān, stating that "it is a very ancient borrowing from the Chinese to-man 多万 ("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 Fei wên yün fu (Ch. 73); the notion "several or many myriads" is usually expressed by shou wan 數萬. The


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


4 Despite the sweeping criticism of G. J. Ramstedt (Journ. de la Soc. indo-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.


7 The opinion of M. Blochet is not quite clear to me. According to him, tumān is the older and original form (and this is also my opinion), and Persian tumān 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 万 was *ban, and a Chinese to-万 borrowed by
Turks during or before the Tang period would have resulted in *daban or
*duban; whereas an ancient Turkish or Mongol tu or tü, according to the
phonetic rules of transcription, would always presuppose an initial aspirate on
the part of modern (that is, post-Tang) Chinese. 1 It is not necessary, how-
ever, 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 pro-
duced by the supporters of the Chinese theory.

I had expected that A. MEILLET’s conclusive study of the Tokharian nu-
merals 3 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” (tmān in Tokharian A, and tumane,
tumane 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 tmān
phonetically is on the same level as Russian tma (тма or тна), which appears
as early as the time of the Slavic-Church language and Old Russian. There
are, further, the following derivatives: tennik (темник) and tmo-nažalnik
(тмоначалникъ), “commander of ten thousand;” tmoryi (тмовый), “relative
to ten thousand;” tmorišec (тморищем) and tmoriš (тмориш), “many
times, incessantly;” tmorišnyi (тморишинъ), tonomuki (ттомуший), and tmo-
tomnyi (томтонный), “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 съ-миш и съ-маш.

2 Les noms de nombre en Tokharian B (Mémoires de la Société de linguistiques de


4 VLADIMIR DAL, Толковый словарь живого русского языка, Vol. IV, 
col. 767, 773, 887. The Russian word was formerly derived from Turkish by H. YULE
(Moderne-Turken, p. 929), and recently by GOMOZE (n. c.). Yule pointed to Heberstein,
who about 1559 reported that “one thousand in the language of the people is called
tisitses (тысяча): likewise ten thousand in a single word tma.”
strictly points to mediæval times. In view of Avestan haēvar, Pahlavi 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 tumān, while none of those languages exhibits a final e like Tokharian B tumane, and still less a contracted form like Tokharian A tumān. 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 line, 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;" that tumān-dār 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 tumān 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 頭曼, who died in 209 B. C., with Turkish tuman ("ten thousand"), as has been suggested by E. BOCHEF (Les inscriptions turques de l'Orkhon, p. 7, note 3). The Chinese transcription t'ou-man may well correspond to a Turkish tumam; but the latter, after all, may have had another meaning.

2 The same definition is given under tuman by G. TEMPLE, in his Glossary of Indian Terms, p. 262 (London, 1897). It was the Mogul emperors who with their army organization transplanted the matter and the term into India.
thousand men a *lac*, and that of ten thousand a *toman*" (ed. of Yule and Cordier, Vol. I, p. 261). 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 Chilarach 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 Hystaspes. 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 initiators 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 Ničči, 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. Watters 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.

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1 In like manner Iba Battta says that each squadron of the Khan was composed of ten thousand men, the chief of whom is styled emir *tūmān* (ed. of Durrā-\*mesh\* and Sanqinatti, Vol. IV, p. 300). The military division of the Mongols into *tūmān* appears also from the chronicle of Sasan Setsen (J. 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.

MÉLANGES.

SE-TIAO.

In speaking of the country Se-tiao (Ts'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 gramana P'o-t'si-pa-t'o 菩提拔陁 (Bodhisattva) in regard to this country would merit a special examination. Bodhisattva, 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為車。斯調國出火浣布以樹皮為之。其樹入火不燃。Lo yang kia lan ki, Ch. 4, p. 15 b, ed. of Han Wei ts'un shu). This is the passage to which I incidentally referred on p. 353, unfortunately relying on the T'u shu tsi ch'êny, which has the wrong reading 車斯國 (my remark on this alleged country Kô-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 tsu tsu (Ch. 16, p. 15, ed. of Pai hai), where it is said: 獵得者刃刺不傷積薪焚之不死、乃大杖擊之骨碎乃死. The animal féng li (p. 343), however, is not given as a synonyme of ki-ku in this work, as wrongly stated in the Pên ts'ao kang mu, but is treated there as a separate subject (Ch. 15, p. 8 b). See also T'ai p'ing huan yù 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 Moslems 1) 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-Būrānī (973—1048), the eighth section of which contains the following on a product called al-chītūwā): "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 exsude. 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 dinār at a weight of one hundred drams; then it sinks as low as one dinār, regardless of weight”.

At the end of another treatise dealing with the volumes of metals

2) L. c., p. 353.
and precious stones, al-Berûnî expands on the fashions to which the latter are subjected, and speaks again on the *chutwū* : "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 *chutwū*. 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 *chutwū* 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 'Iraq into a country nearer to this tribe". In a footnote Prof. Wiedemann remarks: "The significance of *al-chutwū* is not clear. Perhaps mammoth-teeth are understood. A passage in al-Afkâni's dissertation on precious stones regarding this material runs thus; *Chartūt* is called also *chutwū*. Abûl Raiḥân al-Berûnî 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-Berûnî) 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 Ichwân al-Râzîjâns 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 hemorr-
roides".

At the end of Wiedemann's paper G. Jacob 1) imparts informa-
tion on the subject from a Turkish work on mineralogy written
in 917 (1511/12 A.D.) by Jaḥjā Ibn Muḥammad al Gaffārī, who
makes the following statement: "On the Ḥutū Tooth. The Ḥutū 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 damas-
keening. When the Ḥutū 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 Mecca 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. Jacob 2) has the
further merit of pointing to Bretschneider's Mediaeval Researches
(Vol. I, p. 153) where it is said in Ch'ang Tē's travels: "The
*gu-du-si* is the horn of a large serpent. It has the property of
neutralizing poison". He further refers to Ussu (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.
The oldest Chinese source referred to in the P'ei wen yün fu as containing an allusion to ku-tu-si is the Sung no ki wên 桑稷備 "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) 4). 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".

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 shì, 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" 柑柤犀、千歲蛇角、叉為 européen犀. 

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 Gilb (Biographical Dictionary, p. 344); compare also Chavannes, Voyageurs chinois chez les Khitan et les Joutchen (Journal asiatique, Mai-Juin, 1898, p. 370).

3) 骨柤犀不甚大，紋如象牙，帶黃色，作刀靶者已為無價之寶也。Quoted in P'ei wen yün fu, Ch. 8, p. 89 b; in the same way in P'en t'iao keng 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 骨柤犀) 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-tsi 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-Beruni, 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 language 1). The second of these words tu-na-tsi does not seem to occur in any later source.

The glossary of the Liao shi is not intended to embrace au

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1) In the Sung shi kuang ki 秋時廣記 by Ch'en Yüan-ts'ing 陳元靚 of the Sung period (Ch. 40, p. 11; edited by Lu Sin-yüan in his Sai yan kuan low ts'ung shu; see Pelliot, B.E.F.E.O., Vol. IX, 1909, p. 224) occurs the word ku-tu 骨赭. The character (not in Giles) is read k'u in the tribal name Yue (mouth) - k'u, but otherwise tu 嘆 (according to T'ai yun), and according to the Yü p'ien of 543 means 'divination from the voices of birds' (鳥鳴騰知吉凶). 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 (t'ao 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 BRETSCHNEIDER'S Botanicon Sinicum), and has therefore no relation whatever to the ku-tu-tsi 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 passage. 1)

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 Breitschneider 2) 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* 骨篳犀 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 Shî-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*(鑣)-*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*.


3) In the first edition of his translation of the work which appeared in the *Chinese Recorder* (Vol. VI, p. 19) Breitschneider 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 Breitschneider, 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
T'ao Tsung-i 陶宗儀, the author of the interesting work *Cho keng lu* 齊耕錄, published in 1866, has devoted a brief notice to this subject. The edition referred to is that printed in 1459 (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'ou chi* 衛藏圖譜 (Ch. F, p. 23 b., in the original edition of 1703, where ku-tu-si 骨篩犀 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 miraculæs mentioned is quoted from a work *Yi shi* 譯史 (not to be confounded with the *Yi shi* 繹史 by Ma Su of 1670 in 48 vols.), a curious small book written in four chapters by Lu Te-yün 陸大雲 (T. Yün-shí 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 Sheng Mei-k', the authors of the *Wei Ts'ang t'ou 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 shi* 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, mixes 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 hung mao*. 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'ou k'ao* 西藏圖考, by Huang Pei-k'iao 黃沛翔 of Hu-an (first published in 1886, reprinted in the geographical collection *Huang ch'iao fan shu yü ts'ang shu*, 1903, vols. 1—3; Ch. 6, p. 27 b.). Here again it is merely a case of reproduction without the evidence of a personal experience.

57
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 骨啮" 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 Shén-mung pén ts'ao king (Ch. 2, p. 31 a; edition of Chou-ših hui k'o t'ien 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"

2) 骨啮犀大蛇之角也, 其性至毒解諸毒, 盖以毒攻毒也, 故曰毒犀, 唐書有古都那必其地所產, 今人訛為骨啮耳。Pei wén yün fu (Ch. 8, p. 89 b) gives only the first clause with the variant 解猟毒如犀角 "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: 唐書有古都那亦産此則骨啮又似古都之訛也. This seems to mean: "The T'ang shu mentions the country of Ku-tu as producing this (horn), so that the word ku-tu 骨啮
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* 甲) 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 antidote 乙).

A country *Ku-tu* 古都 is not known to me; but *T'ang chu*, Ch. 221, contains a notice of the country *Ku-tu* 古都 identified seems to be erroneous for *ku-tu* 古都. — Another way of writing is introduced into a work entitled *Liang ch'iao chai yü* 播摘駭 (quoted in *P'e i wên yün fu*, Ch. 92, p. 18 b) where it is said: "What is now called *ku-tu-si* 骨拙犀 is the horn of a snake; being poisonous by nature, it is capable of neutralizing poisons, and is therefore called *ku tu si* 骨拙犀". 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'e i wên yün fu* regards this as the standard mode of writing. The transcription 古都 occurs again in the *Ko ku yao lun* (see farther on).

2) *P'en ts'ao keng 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* 青 and *zi* 犀 originally refer to a Lovine 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* 青 and *zi* 犀 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 *zi* to the two-horned rhinoceros (*Rhinoceros sumatrensis*).
by M. CHAVANNES 1) with Khottal on the upper Oxus north-east of Tokharistan. 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" 古都之角 by the commentator as a designation for "the blue-green rhinoceros-horn" 蝙犀 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'tin 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 蓬角, 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

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1) Documents sur les Toubous (Turcs) occidentaux, p. 168 (and see Index).
2) Quoted in Pei wen 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 T, 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* 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 Tao 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. It 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 mongolischem Literatur* (Keleti Szemla, 1907, p. 215) the name of the author, on the authority of Bretschneider, had been given by me as *Kuai-chan*. PAUL PELLOT, with obliging courtesy, has been good enough to inform me that *Kuai-chan* 戒山 is only his *hao*, and that his real name is Chao Yuan-p'ing 鄧遠平. The passage of the *Yüan shi lei pien* is not quoted in *P'ei wên yün fu*.


4) 他箋犀碧犀也, 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, 故貴重能消腫 [解] 毒. *P'ei wên yün fu* (Ch. 8, p. 99 b) and *P'en ts'ao kung mien* (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 chêng *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 sî* “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 1673 and first printed in 1696, has been traced by Bretschneider (*Bot. Sin.*, pt. 1, p. 56), who states that the earliest edition now extant seems to be that of the year 1686. But there are others ones in existence. Hirn (*J. China Branch R. A. S.*, Vol. XXI, 1886, p. 329) refers to a Ming print of 1603, possibly the second edition published. An edition of 1645 in 16 vols., edited by Ni Shun-yü 倪純祐 of Hang-chou, was secured by me in Tokyo and is now deposited in the John Crear Library of Chicago, which, besides, has an edition of 1826 in 39 vols., and one issued in 1886 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 T’ao-kuang editions. Despite diligent search and many efforts I failed to discover in China the *edicio 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 Sî-nan 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’ung chi kien ch’uan pên shu mu* (Ch. 8, p. 11; compare the notice of Chayannes, *T’oung Pao*, 1910, p. 145) 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 *pên 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 i* 本草綱目拾遺 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.
AID CHINESE TRADE IN WALRUS AND NARWHAL IVORY.

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 Yuan 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 Pelliot (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'ang shi (edition of 1481, Ch. 89, fol. 19 a, 21 a) mentions a horn yin ya kio 陰牙角 as product of Hami and Qarâ-khodjo 火州 (see Pelliot, Journal asiatique, 1912, pp. 579-603), and a tu ho kio 速霍角 as a product of the latter locality only. According to the geographical section of the T'ang shu (quoted in Pei wên yün fe, Ch. 92, p. 26) both these products were sent as tribute (no date given) from Pei sîng 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 Tao 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

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 mammoth 1) 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 snakes 2). 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 隐鼠, '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 Irtsech-Ostfachen und ihre Volksoersie, Vol. I, pp. 123—124, St. Pet., 1897). Li Shi-chüèn has gathered the principal notes on the subject in his Pên ts'ao kung mu (Ch. 61 f., 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 Kirchta and had the name of the animal pointed out to him in that book. F. W. Matzen 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 Kuang-hi was called to it by Russians presenting themselves at his court in 1721 (see Matzen, I, 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 P. J. v. Strahlenberg (Das nord- und östliche Thier 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 narwhal 1). 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 111 Delphinidae, sub-family 1 Delphinapterinae, genus *Monodon*, species *monoceros*, 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-ni*, — 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 footnote 1). 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 Pinnipeds, 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 *monoecerus* 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. 192, Edinburgh, 1837). "The creature grows to a length of about fifteen feet; such an individual would have a 'horn' of some seven feet" (P. E. Boddart, A Book of Whales, p. 247, New York, 1900). Anselmus Borkius de Boot, court-physician to the Emperor Rudolf II (Gemmarum et Lapidum historia, ed. A. Toll, p. 434, Lugduni Batavorum, 1638; the first edition of this interesting work had appeared at Hanover in 1609) describes a walrus-tusk (*rosarii denua*) which he had seen at the end of the sixteenth century in the possession of a druggist at Venice (*simplicieta rerum exoticarum studiorum*) and expressly states that during and before his time these tusks were confounded with, and sold in the place of, rhinoceros-horn, the bestest 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 exignus adversus venena habet virtus*). — 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 centuries, 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 Mongols and is finally endorsed by Li Shi-chén. There is

moth and walrus ivory as mon 'horn' (Peińska, Short Russian Yakut-Vocabulary, pp. 37, 108, Irkutsk, 1906). The mammoth tusk is regarded by the native tribes of Siberia as a horn, the Yukaghir word solhatömmn meaning ‘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 remain utterly unknown to most people as animals, and that tusks and horn are often 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 Umsegelung Asiens und Europas auf der Vega, Vol. I, p. 378, and K. v. Ditmar, Reisen und Aufenthalte 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-tu-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 alike\(^1\). 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-Beruni 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 Karamzin, 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

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\(^1\) Bretschneider’s (*Medieval Researches*, Vol. I, p. 153) contributions to the elucidation of *ku-tu-si* are now, of course, without any value, as the Liso 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. Baken2) 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 objects4). 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 sanitum belluarum insigniunt ensium capulos. Candidant enim ad eburneum claritatem.


3) Reisen und Forschungen im Amur-Lande, Vol. 1, 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 rubles⁴). I have no information on the further handling of this merchandise at Vladivostok, but I 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


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-Beruni 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. Brehm5) whose work is still considered (and justly) by naturalists as a classical treatise. Had Wiedemann had access to it, he could not have

1) The most interesting account of the ivory industry in the East will be found in A. de Puyouville, L'art indochinois, pp. 183—191 (Paris, no year).
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 productivity 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 or 獨角魚之齒 is the translation of marine ivory (Vol. I, p. 1261).
5) Anatomische und zoologische Untersuchungen über das Wallross (Trichechus Ross-marus), in Mémoires de l'Académie imp. des sciences de St.-Pétersbourg, sixième série, Vol. IV, 238, 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 *chutuw* 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. Bahr 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 Ótheræ 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 England\(^1\). The main purpose of his voyage was to obtain "horsewhales (*horshuael*), which have in their teeth bones of great price and excellencia." 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. Bahr 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-teets\(^2\). 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,

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1) Ótheræ'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 *balỳh*, *i.e.* a fish.
and remarks that they are called fish-teeth. Still earlier in 1517 the learned Pole Matthias Meckovius 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 poudere gravissimos capiunt: et Moschovitis pendant atque vendunt: Moschoviae vero bis utuntur: ad Tartarium quoque et Turciam mit-tunt, ad paradum manubria gladiorum, framearum, cultrorum, quoniam gravitate sui majorem et fortiores impressionem impingunt." Karamzin observes that the expression "tooth" (ay6a) 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 Sviatoslav 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 Asia 1), and Ivan Vasilyevich received in 1476 a fish-tooth as a gift from a citizen of Novgorod. So far v. Bärr 2). 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 Kwang, king of Siura

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 Frânn (Ibn-Fuzlan, p. 229) as saying that in Khiwa 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 ponies 1), silk textiles called chao hia 2), silk textiles called fish-tusks 魚牙絹,

1) 果下馬. First mentioned in *How Han shu* (Ch. 115, p. 5) as an animal occurring in the country of Wei 滬 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 *Sam 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 (167-167 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 Kokuryó) 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 Kokuryó (*Kao-kou-li*), the son of the sun-god, who was in his youth the groom of the king of Fu-yü, at which time he made a close study of horses (compare *Pei wei wén yùn fu*, Ch. 51, p. 9 b, which does not quote the oldest reference in the *How Han shu*). A. Pflimlaiter (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 即果下也 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 Ireland, 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 Mittelmeier-Inseln, p. 125, Zürich, 1911). The above Chinese data are presumably the oldest on record anent such an insular dwarfish breed.

and skins of Phoca equestris (T'ang shu, Ch. 220, p. 9b). In the Ta-te fu yüan kuei (as quoted in K'iu ting Man-chou yüan liu k'ao, Ch. 19, p. 5) an embassy from Siuira is more specifically assigned to the year 723, the list of products being the same, with the addition of bezoar 牛黄, 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-tuks and chao hia silks, and the same objects are enumerated again in K'iu T'ang shu (Ch. 199 上, p. 9a), among the tribute gifts offered by Siuira in 773. But in the latter text we meet an important variant reading 献金銀牛黃魚牙, 納朝霞絹等 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 wen yün fu (Ch. 21, p. 124b) this passage is quoted under the catchword yü ya 魚牙, though in the text ch'ou 絹

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 Siuira. 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 Pallii (also histriophoca fasciata), first briefly described by Pallii (Zoographia Rossio-asiaica, Vol. I, p. 111, St. Pet., 1811), then more accurately by L. v. Schrenck (Reisen und Forschungen im Amur-Lande, Vol. I, Säugtiere, 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 alaká, the Gilyak atk, the Ainu targa. Its habitat is formed by the Bering Sea, the coasts of Kamchatka, 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. 10 b); edition of 1461 lists hai pao skins as products of Korea and the Su-shén country; other Pinnipedia are enumerated there as the sea-ass, sea-badger, sea-cr, sea-dog, and sea-pig. The latter can safely be identified with Otaria mirina L., the so-called fur seal of commerce, as the Tungusian tribe of the Mangun calls it also mu-nuggfty, 'water-boar' (Schrenck, l.c., p. 189). Schielberg's explanation of hai pao as sea-lion (T'ang Pao, Vol. III, 1892, p 606) 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 纳. 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 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 wen yün fu, Ch. 21, p. 126). The oldest account of the whale (defined by the Shuo
wên as a 'big sea-fish', by the Yü p'ien as 'the king of the fishes'), I believe, is extant in
the Ku k'in chü 古今注 by Ts'uei Pao of the middle of the fourth century (Ch. 2,
p. 9 b; edition of Han Wei t'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 in-
dividual 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 eight 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 spitting water out of their jaws.
All the water animals, terror-stricken, take to flight, no one daring to oppose resistance.
The female is called i(n); 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，至七八月畢從其子還大海中，鼓浪
成雷，噴沫成雨，水族驚畏皆逃，匿莫敢當
者，其雌曰鯨，大者亦長千里，眼為明月珠．
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 Hiatus's China and the Roman
Orient, and Chavannes, T'oung Pao, 1907, p. 181. It should not be supposed, however,
the same manner 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 yue chu was coined only at the time of Chinese relations with Ta Ts'ien, but as shown by the quotations given in Pei wen yin fu (Ch. 7 A, p. 97), it occurs twice in the Shi ki of Se-ma Ts'ien. In the periods K'ai-yuan (713—742) and T'ien-pao (743—766) the Mo-ho of the Sungari sent as tribute pupils of the eyes of whales 綛睛, sable-skins and white hare-skins (Fang zh, Ch. 219, p. 6), and according to Ti'ea fu yin kuei (quoted in K'in ting Man-chou yian liu kao, Ch. 19, p. 5), the Mo-ho sent the same objects (綛銳魚睛) in 719. Ta Ming i t'ang 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, Young Pao, Vol VI, 1895, p. 41). — The coincidence of Gilyak kuii (among the Orochon, a Tungusian tribe on Sachalin Island, who call themselves Ulica, I noted k'uiia) 'whale' with Chinese k'ing is curious. Müllendorff, 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-Altaic languages, makes Grube say that kui is a Chinese loanword in Gilyak. Gaube has never said anything so foolish as that, but has simply recorded the word, without further comment, from the notes of Schrenck in his Gilyakisches Wörterverzeichnus, p. 50 (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 (Balaeoptera longimanus) 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 kuiia, moreover, shows that the word kui is or more correctly kui is a specific Sachalin word, for the Tungusians on the mainland designate the whale as kuiyin, the Gold on the Amur as k'ilyiia. As the word kui 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 (Young 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 pu of 1588 (Ch. 4 F, p. 62) is an illustration of a huan k'ing pao chu 玄鯨寶柱 ‘precious pillar (ratanastambha) 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 T'ang 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

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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, f01 10 b) where shun kio 猟 角 is recorded as one of the products of the country of the Su-shên, a gloss being added to the effect *郎海 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 interwoven), point to a great antiquity as regards their acquaintance with these animals.

W. Boas, our great authority on the Chukchi, has given a vivid description of walrus-hunting as practised by this people. 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 1788.

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

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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. Nordensköld (i.e., 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 color 1). 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 ivory 2), 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

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1) This chimes in with the yellow color which Hung Hao 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 age\(^1\),
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 material\(^2\).

1) Also v. Nordenskiöld (\textit{a. e.} p. 157) 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 \textit{kw-su-i} in the country of the Khitan, the two Khitan words
\textit{kw-su-i} and \textit{sw-su-i}, 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, in-
habited under the T'ang a territory bordered in the east by the Mo-ho of the Sungari,
in the west by the Ta-kué, 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,
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 無洛侯. *“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 *Yu-k(i?)-wu 于已尼大水* which is called the
Northern Sea*.\(^3\)

\(^3\) WASSILJEFF (\textit{Tруда Восточного Ом. Цм. Археолог. Общем}, 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 Kiug-yüan (262 A. D.) that the country of the Su-shén sent a tribute of thirty bows three feet and five inches long, arrows of the wood hu 鵝 1) one foot and

quite out of the question as capable of being identified with the river Nuus which, as is plainly said in the text, flows into the eastern ocean. The Amer 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 further than the valley of the Onon and probably lead us into the river system of the Witim and Lena. The identification of the Pei bei 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 Wuthrich. 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 Khitan (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 Yu hench (compare Bretschneider, Bot. Sin., pt. 2, No. 543). In the place of 鵝, other texts write 且, also unexplained
eight inches long, three hundred stone crossbows 石矢，a mixed lot of twenty armors of leather, bone, and iron 皮骨鐵雜鎧 Twenty 領, and four hundred sable-skims. 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'an1) 犁弓, 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

(1bid., No. 569). The arrowheads of the Su-shên and allied tribes were chipped from flint. The principal passages relating to the flint arrowheads 石矢 of the ancient Tangusian 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; Pèi shí, Ch. 94, p. 7; Tang shu, Ch. 219, p. 5 b (compare Jade, pp. 67 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-sî 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 unkôru or unikôru (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

Rémušat¹) 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 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 (zōge) 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).

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¹) Notices et extraits des manuscrits de la Bibliothèque Nationale, Vol. XI, pt. I, p. 198 (Paris, 1887). Dr. Müller accepted this interpretation of Rémušat 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 sh'ai t'ai an) on which the argument of Rémušat 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.


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


⁵) It would be interesting to know from what Japanese source this information is
Under the Liao and the Chi, *ku-tu-si* does not seem to have entered the pharmacopoeia); 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. 28 of his interesting and attractive work, Mr. Brockhaus quotes from the Japanese book *Shinsa biycho* of 1781 the sentence that "there is a material sold by tricky dealers under the name *miyagyo 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 *miyagyo* (Chinese *fen yu*）is an ancient general designation for Pinnipedia which occurs as early as Se-ma Ts'ien's *Shi* li (Chavannes, Les mémoires historiques de Se-ma Ts'ien, Vol. II, p. 190), and G. Schlegel (T. Young *Paio*, 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. Boscombe (Memoirs Am. Mus. Nat. Hist., Vol. XI, p. 390) 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 (I. c., p. 84) observes in regard to the seal-ion 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 *netamai*.

1) This is confirmed by the fact that the work of Li Shi-chên is the first and only *Pin 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 1308 by the physician T'ang Shan-wei 唐慎微. BRENNER (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-nga-tsu, 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-kuan 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 Chin in 1204, with re-editions in 1296 and 1214. A facsimile of the Sung print saw the light under the Yuan in 1302. From the Ming period no less than six editions are noted by Mo Yu-chi: 1468, reprint of the Chin edition of 1204; 1523, facsimile of the Sung print; 1573; 1677, reprint of the Yuan edition, followed by a new edition in 1879; finally 1598, the last three falling within the period Wan-Hi. Under the Manchu only one edition was published in 1656 in the reign of Shun-chih, which appears to be the last. It will be recognized that the *Chêng lei* maintained its place till the appearance of the *Pên ts'ao hang shu* in 1596 supplanted it. The T'ien-lu-ts'ang 天祿琳琅 Library possessed copies of the Sung, Chin, and Yuan 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 帳 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 帳 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 hulu and chuhtone 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 於寒, 'the cold-dispelling horn', pi-shu 於暑, 'the heat-dispelling horn', ye-ming 夜明, 'the horn shining at night', kian-fen 鍵念, 'the wrath-removing horn', pi-ch'en 於塵, '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 Tun-gusian words, a Mo-ho word kulu, and a Khitan word kutusi; this would mean that the latter is a compound in which kulu is the name of the animal itself and si may have the significance of tooth or horn. Indeed the parallel Khitan word tunusi may lead one to the same view. In the present state of our meagre and inaccurate knowledge of Tun-gusian 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 Tun-gusian 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 Kam-chadal, 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 poison\(^1\). We see how this belief was gradually aggrandised, if we compare the simple statement of Ch'ang Tê 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 *chutu* cannot be explained from Arabic, as Prof. Wiedemann says, it would be reasonable to infer that it is derived from Chinese-Khitan *ku-tu-si*, and Turkish *hutü* 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-task 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 medieval bestiaries. Dr. E. L. Trouessart 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 cotonii*) est très probablement l'Unicorn ou Licorne des anciens. Citésins (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 heraldique qui figure comme support dans les armes de la Grande-Bretagne". The passage here referred to in Citésins 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. Reinhardt 1) made an emphatic plea on behalf of the *chutuw* 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 *chutuw*. Why should the Egyptians have craved it and purchased it for a price two hundred times its value, if *chutuw* 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 mammoth 2). 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

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2) According to S. Patkanov (*Die Irtsch-Ostjakem*, 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; Su Sung says that it resembles the ox (*Pin t'ao hung mun*, 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) When I incidentally refer to Djaqatai *kotat* and Taranchi *kotaz*, 'yak' (Radeloff's *Versuch eines Worterbuches der Turk-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 *MOPJi7b*. In the Latin account of Matthias Micbiovius of 1517 (quoted above) it appears as *morsus* (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 account K. E. v. Baer, *L.c.*, p. 111). A translation of Herberstein published at Basel in 1667 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 *c.\* (Rom, 1655) the etymological joke is perpetrated to derive the word from *mordere* 'to bite': Norvanguardiit *litus maximos ac grandes peces elephantias magnitudine habet, qui morsui seu rosmari vocantur, forsitan ab *sepe* meronendi sic appellati etc. (ibid., p. 112). The latinized *rosmarus* is derived from Skandinavian *rosahvalr* (= horsewhale; Norwegian *rostungr*, Anglo Saxon *horsnæcel*, Dutch *walrus*). Hence the popular names sea-horse (*cheval marin*) and sea-cow (*vaches marine*; latinized *bos marinum*; the early French settlers in America used the expression *bête à la grande dent*).—G. Schlegel (*Young Poe*, Vol. VI, 1805, p. 24) remarked: "Le Narwal est bien connu des Chinois qui l'appellent Loh-za-ma 落斯馬: un nom que nous n'avons pas pu identifier". Apparently this *lo-za-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

91
adhere to the conclusion that Arabic chutuw and Turkish huti 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 Shi s i (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 chung 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 shachikoko; this word denotes the grampus, and the Japanese were not acquainted either with the narwhal as an animal species.
Additional Notes on Ku-tu-sl.

An interesting text relative to ku-tu-sl occurs in the Yün yen kuo yen lu, a work inserted in the Shi wén kūan lou ts‘ung shu of Lu Sin-yüan (compare P. Pelliot, 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 骨啮犀, whilst the edition of Lu Sin-yüan (Ch. 上, p. 17), in the first paragraph, has twice altered the syllable ku into kuo 骨 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. Pelliot 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. Pelliot 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. Breitschneider (Bot. Sin., pt. 1, p. 141, No. 48) makes him live: latter part of the thirteenth and beginning of the fourteenth century. According to Se k‘u... (Ch. 141, p. 34), he lived under the Southern Sung in the thirteenth century (Hirth in the writer’s Chinese Pottery, p. 5).
of Tang 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 Ch' \( k'\ ense \- lu \), as given above (p. 321), and although the date of Tang 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, 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 cinnamon \(^1\); 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僞物也.”

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 zoologist, 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 Sinicun, II, p. 384, yen-kouri is an old name of the Olea fragrans.
Ko chi king yüan (Ch. 33, p. 11b) quotes a text from the Su
ku Sung mo ki wén, apparently a continuation to the Sung mo
ki wén by Hung Hao; the date of this appendix is not known to
me. This passage is as follows: "The Khitau hold the ku-tu-ši in
estee. 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 Tien Tsu¹) had made from this substance a t'u-hš (gloss:
called in Chinese: yao t'iao p'i 'leather strip for the loins') fastened
to and hanging down the head (?)." 契丹重骨雕犀, 犀不
大, 萬株犀無一, 不曾作帙, 枝如象牙帶黃
色, 止是作刀把已為無價, 天祥以此作貎鶽
gloss: 中國誇之腰條皮)插三頭者.

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

The word kuo hia ma 果下馬 figures as a Khitau 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 reason-
able to expect that the word is of Korean origin; but I am unable
to trace it in the Korean Dictionary published by the French Mis-
ionaries 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. 939). The history of his reign is
recorded in Liao shi, Chs. 27—30.

²) W. Gause, Goldisch-deutsches Wörterverzeichnis, p. 79.
The Manchu equivalent of hai pao 海豹 is huwethi (Yu chi se t'ie ts'ing wen kien, Ch. 31, p. 18). Sacharov (Manchu-Russian Dictionary, p. 452) who writes huwethi explains the word as a seal with short hair of dark color with a greenish tinge.

The Ostyak word for mammoth mä-čar is discussed by Ö. Beke (Keleti Szemle, Vol. XIII, 1912, p. 120) and compared to Wogul mä-čar (mä, 'earth,' and čar, '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-chartāt or al-chutuww (rendering it by mammoth-teeth followed by an interrogation-mark) by reproducing a statement of al-Berūnī as embodied in the work of al-Afkānī. Speaking of the fish-teeth wrought into knife-hafts, al-Berūnī here concludes that al-chutuww 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-chutuww. In this place Wiedemann alludes also to Fränk's Ibn Fozzlau (St. Pet., 1823, pp. 228-9) where according to the Strat al-Mulak ("Chronicle of the Kings") of 1076 by the Vesir Nizam 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 *chutuw* 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-Chutuw." Wrongly assuming that it is now certain that *al-chutuw* means rhinoceros-horn, he furnishes very interesting material regarding the latter, chiefly after Qazwini 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 *Tu king pén ts'ao* published by imperial order in the Sung period, in his account on the rhinoceros (*Pén ts'ao kang mu*, Ch. 51 上, p. 5 b) has the following story attributed to Wu Shi-kao 吳士皇, a physician of the T'ang period; according to the fuller version of the *Chiing lei pén ts'ao* (Ch. 17, fol. 21 b), this physician served in an official capacity

¹) Also the passage translated by Ruska from Damiri is cited by Reinaud in his notes (Vol. II, p. 69). In regard to Qazwini, G. Jacob (*Ein arabischer Berichterstatter 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 proceeded 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." 唐醫吳士陛言，海上取犀先於山路多植朽木如豬羊棲，其犀前脚直常依木而息。朽木忽然折倒仆久不能起因格殺之（Chēng lei pén ts’ao adds: 而取其角 "and capture its horn"）

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")

1) Groeneweldt (Ts'ung 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); F. Peters, Der griechische Physiologus und seine orientalischen Übersetzungen, p. 39 (Berlin, 1898); K. Ahrens, Das Buch der Naturgegenstände, p. 40 (Kiel, 1892); F. Hommel, Die aethiopische 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 Soleimau 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 T'ang 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 \((\textit{Nat. Hist.} \text{ VIII, 39})\) and Caesar \((\textit{De bello gallico} \text{ comm. VI, 27})\) 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 animal\(^1\). As to Pliny \((23-79 \text{ A.D.})\), F. Hommel\(^2\) assumes that among the Greek works ransacked by him there was also the \textit{Physiologus}; it is not known to me whether this opinion is shared or still upheld by classical philologists. As to Caesar \((\text{B.C.} 100-44)\), I do not venture to set forth an opinion as to the possible dependence of his story on that of the primeval \textit{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 \textit{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.

2) \textit{L.c.}, p. XXXIV.
ADDENDA
PAR
PAUL PELLIOJ-

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-chutaw_ 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 parait 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 trouver, malheureusement, le passage du commentaire du _Chan hai king_ que cite le _P'ei wen yun fou_; il devrait cependant s'agir au principe du commentaire de Kouo P'ouo, ce qui attesterait l'existence de l'expression _pi-si_ au moins au début du IVe 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, s'agissent à une forme 碧犀 _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 Giles 1). 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 faudrait tâcher de retrouver l'expression dans les textes.

Eu 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°, du *Leao che* et a supposé qu'on devait la retrouver dans le *Kin che*. Eu effet, au chap. 64, fol. 2 r°, du *Kin che*, il est question de "poignard à [manche de] kou-tou-si des anciens Leao" (故遼骨贈犀 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 紹 tekeou, 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 du, 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 豚髀 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. Guérin, *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 centrale 1). Mais la gloire 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 鬨麟 (ou-hou ²); le mot a désigné une ceinture, ou plutôt un pendant de ceinture, aussi bien au temps des Liao que sous les Kin.

Dans ses notes additionnelles (p. 357—358), M. Laufer a traduit un curieux texte du Yun 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 eu 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 suppler à cette lacune en groupant dans son 宋史翼 Song che yi (chap. 34, fol. t ⁹—9 r°) les principaux renseignements qui nous sont parvenus sur ce personnage ³). Il en résulte que Tcheou Mi dut naitre 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-kiai ⁴) de Haug-tcheou et passa le reste de sa vie à s'occ-

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1) Cf. D. Ross, A polyglott list of birds, p. 274.
2) Par exemple dans Liao che, chap. 96, fol. 3 r°, dans Kim che, chap. 64, fol. 2 r°, etc.
4) Ainsi s'explique le titre de 癸辛雜識 Kouei sin tea 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 Tei tong ye yu; 2° 癸辛雜議 Kouei sin tea che; 3° 志雅堂雜錄 Tche ya l'ang tea tch'ao; 4° 浩然齋雅談 Hao jan tohai ya t'an; 5° 浩然齋視聽鈔 Hao jan tohai che l'ing tch'ao; 6° 澄懷錄 Tch'enghoui lou; 7° 乾淳起居注 K'ien tch'ouen k'i kiu tohou; 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 Taiue miao hao ts'eu. Presque toutes ces œuvres nous sont parvenues et il y a eu des rééditions modernes.

Selon le 元藝文志 Yuan yi wen tche de Ta'i-eu Ta-hin, qui est devenu le chap. 94 (fol. 3 v°) du 元史新編 Yuan che sin pien de Wei Yuan, il faudrait encore ajouter le 蠟屓集 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. Lanfer 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 mien-hao de la fin des Song.

104
XIIIe siècle, 鮮于樵 Sien-yu Tch'ou 1). 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 sur-

nom. 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 un 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-tseu 3). 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 incorpóres au chap. 4 du 元文類 Yuan wen lei; d'autres se trouvent au chap. 4 (fol. 8 v°—9 r°) du 元詩紀事 Yuan che ki che; cf aussi P'ei wen tchai chou houa p'ou, chap. 37, fol. 2 v°. Les bibliographes de K'ien-long (Catalogue impérial, chap. 129, fol. 1 r° et v°) 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 1888. D'après ces bibliographes, Ts'ao Jong avait incorporé l'ouvrage à son 學海類編 Hio hai lei piem (sur cette collection, cf. Catalogue impérial, chap. 134, fol. 21 r°—22 v°); mais le Hio hai lei piem 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 ouvrage se trouve dans le Tche pow tseu tchai t'aou chou; un passage me paraît gêner l'attribution à Sien-yu Tch'ou

2) Chap. 37, fol. 2 v°.

3) 有兼聴之明而無舊矜之容.
passage du Yun yen kouo yen lou traduit par M. Laufer nous aurait conservé la forme véritable d'un suruum qui a été altéré dans la source du Pei wen tch'ai chou houa p'ou. Quant au texte essentiel relatif au kou-tou-si, celui qui a ensuite passé en 1866 dans le Toho keng lou, il est bien de Tcheou Mi lui-même et se place dans les dernières années du XIIIe 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 Tcheng tseu t'oung, 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.]

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. Pelliot (pp. 365-370). 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 'Yu shu tai ch'ing, following the procedure of Li Shi-chên, has placed that author's text on ku-tu-si in the section on "Snakes" (XIX, 181, hui k'ao ii, p. 16), without adding any further matter, while the text of the Yen 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 encyclopaedia, 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 encyclopaedic 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 wen yen fu, is in T'ang shu, Ch. 40, p. 8 b; also in Ta t'ang ku ten 大唐六典, Ch. 3, p. 6 b (ed. of Kuang ya shu ku, 1896). — Ockere's account (p. 337) is easily accessible in H. Swete's Anglo-Saxon Reader (pp. 17-23, Oxford, 1909); and in English translation in C. H. Bradley, Texts and Versions of Carpenter and Rubruquis (p. 8, London, Hakluyt Society, 1903) 107
In regard to the modern trade with China in marine ivory, S. Wells Williams had stated,—

"Seahorse teeth, 海 馬 牙 hai ma ya, 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. Chesire, Canton (p. 1356):


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 mis'o sin and Mongol aramana. A. Kircher (La Chine illustrée, p. 259, Amsterdam, 1670) figures a (somewhat grotesque) hippopotamus with the legend "I'Hippopotame ou Cheval-Marin appelé Hayme par les Siriens." On the cut we read hai mɔ, 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 soi." See also O. Dapper, Beschrieying des Keizerryks van Taising of Siva, p. 241 (Amsterdam, 1670). The ancient authors, however, understand by the term hai ma a kind of shrimp (.shared) having the shape of a horse, — according to Ch'en 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 ch'u ts'i ch'eng, 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 Raisin, has the following observation in his work Synopsis methodicae animalium quadrupedum (p. 193, Londini, 1693): "Vidi etiam penem eiusmodem animalis [i.e. rosmari, walrus] ossum rotundum, cubitum et amplius longum, crassum, ponderosum ac solidum, in fine prope glandem longe erassiorem et rotundorem. Huius pulsere alPELLENDUM CALECM Młoscovitar uIANTUR. DEentes hi nostrribus Equi marini deentea Sea-horses Teeth appellationur."
“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 (133 lbs). 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 Gishiginek 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. In Korean the walrus is styled yong sé 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...

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1 This means likewise "sea-horse teeth." Kar-ba is the Sinico-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 Nikko, Japan, a narwhal-tooth is still preserved in the temple of Iyemin-u. It is figured in the little guidebook Nikko-san rin-ō-ji gyo-hōmotsu zu-kei 日光山輪王寺御寶物圖解 (p. 5, Tokyo, 1896). Here we find the Portuguese name unicorno (p. 349) written in Kana ウニコウノ (Portuguese unicorne, unicorno), and the rectangular box in which the tusk is kept is inscribed with the words Ban-kaku is-shi 魚角一枝, "a horn of the Barbarians," Ban (Chinese Man) being a Chinese designation of Europeans, in particular of Portuguese and Hollanders. Dr. O. Nachod writes me that according to Guai kō shi kō (p. 706) Holland presented this tusk in 1671. J. Dautremes (Nikko 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 Asie et en Afrique, 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 Kambag. Les offres se font en Maa, dont dit font un Thail. La corne de Narval se payait cette année assez cher; c'était autrefois un objet de contrefaçon 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 exorbitants."
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. Cahn\(^1\) 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 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,\(^3\)

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3 In the *Polyglot Dictionary* (Ch. 30, p. 10) this term corresponds to Tibetan k'tar, d'en, Mongol longkor, Manchu longkom (see also Amiot, *Éloge de Moukden*, p. 265).
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 yú 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 shì (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)." 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 sütten Kirgisen, A.B.A.W., 1865, p. 449). The Russian name is кречётъ S. von Herberstein (Rerum Moscovitarum Commentarii, translated by R. H. Major, Hakluyt Society, 1882, Vol. II, p. 38) 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).

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 écôte 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 fībī daryū فيلي دريا "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) 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 温亦把剌克, 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.

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 魚 has denoted not only "fish," but also "sea-mammals." In the Shi king (II, I, VII, 6; and II, III, IV, 1) we find twice the compound 魚服 rendered

1 M. Pelliot (p. 366) is doubtless correct in assuming that 納 in the text of the Kiu T'ang shu is a misprint for 納 (this reading, indeed, is given in the Pien tei 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. 96, pp. 16 b, 17 b; ed. of Kiang-su shu k'o) 納 appears twice after 魚牙. A curious passage extracted from a Manchu work by Amiot (Éloge de Moukden, p. 290) deserves mention in this connection: "Le lekerhi est 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 Brethschneider (China Review, Vol. V, 1876, p. 173), without explaining what these knives are.

3 Laoze, Chinese Classics, Vol. IV, pp. 261, 286; S Couvreur, Chue 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 (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." 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흽 are twice alluded to in the Shi king, and the ends of the bow were tipped with ivory 象弭. In the Shu king (Tribute of Yu) ivory is simply designated as "teeth" (ch'i 齒), and in the same manner the word is employed in the Chou li. As the word ya enters into the compound niang 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

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

2 Legge, l. c., pp. 77, 164.

3 Legge, l. c., p. 281.

4 Legge, Chinese Classics, Vol. 111, pp. 111, 115; Couvreur, Chou king, pp. 71, 73.

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

6 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 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 hui, 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

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2 KLAPROTH, Journal asiatique, 1833, p. 288; and DULAUERRE, 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, Journeay of William of Rubruck, pp. 12, 38; C. R. BEAZLEY, Texts and Versions of John de Plano Carpini, p. 117; and chiefly G. SCHLEDEL (T'oung Pao, Vol. 111, 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-easterian 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. Kubai. 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 狗国) is vaguely defined as an island in the eastern ocean; 1 the Kingdom of Women (nü kuo 女国), 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 grammar Huei Shên 惠深 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 t'u pien 杜陽雜編 (Ch. 7, p. 15, ed. of Pai Hsi) we read that "in the period Ta-chung 大中 (847—866) the Woman Kingdom 女王国 sent as tribute whale-blubber stuff 龍油綿 and seal-blubber stuffs 魚油綿, with very queer, manicolored patterns; 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 "horn" 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* 楡楨, 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,
and was abandoned by the Kin (p. 366) as well as by the Mongols (p. 320). Under the word ğu 桃 the Dictionary of K'ang-hi cites the T'u king pên 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 ğu-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 ğu-tu 桑 桃 杓, which, according to Pên 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 ğu-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 ğu-tu-si to Tibet (pp. 320—321) by confounding the ivory ğu-tu with the vegetal ğu-tu 桃 杓. On the other hand, we thus obtain a clue as to the reasoning of the Khitan in choosing the latter characters for the purpose of writing the ğu-tu 骨 骸 of the Tang.

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 zoological term “morse;” that is, the walrus.  


1 The origin of the Russian word morz (моржь) is still obscure. Certain it is that it is not Slavic (Polish mors is derived from French mors), but its source is not yet traced. The derivation from Russian more (море), “sea,” as given in the Century Dictionary (see mors), is impossible. The relation to Lapp moris, morša, and Finnish mursu, is not clear (E. HEIM HAM, 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 (Finn-Svenskt Lexicon, Vol. I, p 1094) traces Finnish mursu to Russian morž; and KNUD LEHM (Lexicon Lapponicum, Vol. I, p. 825, Nidrosiae, 1768; and Beschreibelse over Finmarkens Lapper, p. 216, Copenhagen, 1767) records the Lapp word only in the form morš, which would thus point to a Russian source. K. MECKLEIN (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 Belon as follows: "Les Turcs sont quasi aussi grande dépense en leur endroit en l'orfèvrerie, que nous: et ce qu'ils font, est de fort bonne matière. Ils aiment à porter des anneaux, et veulent que leurs couteaux soyêt bien façonnez: et les pendent à vne chaine d'argent, dont la gaine est enrichie de quelques belles garnitures d'or ou d'argêt. C'est vne coutume commune aux Turcs comme aux Grecs de porter les couteaux aux, pédants à la ceine- ture: et sont cûmûnement forgez en Hongrie, ayants le mâche mout long: mais quand les merciers de Turquie les ont achetez, lors ils les baillent aux ouuriers pour leur mettre vn bout, qui est com- munement de dent de Rohart, dont y en à de deux sortes. L'vne

loan-words in Russian. Other Finno-Ugrian and the Samoyed languages have different words; for instance, Ostyak peń-k-voi, "tooth-animal" = walrus (A. AniQUint, Sprache der Nord-Ostjakcn, p. 120), and Samoyed tevot, tutei (CAsTEn, Worterverzeichnisse, pp. 27, 300; regarding the Samoyed's relation to the walrus see V. KReSTuNIN in Kljproth's Magasin ant antiquité, 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 Ether and loudoun, that one was calld mors marime") and in CHANCELOUR (circa 1553) in Halkylt's Fvanges of 1599 ("There are also a fishe's teeth, which fish is called a Morse"). — It may be added that according to Dal' "morse eaters" (море-еды) is a nickname for the inhabitants of Archangel, and that porozub ("horn-tooth") is a synonym of the narwhal.

1 Les Observations de plusieurs singularités et choses memorables, trouvées en Grece, Asie, Iudée, Egypte, Arabie, et autres pays estrangeres, p. 298 (Advera, 1656). The first edition was published in Paris, 1653. Belon (1518—64) was a prominent traveller and naturalist. "L'amour de la vérité, un désir aride 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 XVIe siècle. On peut se fier à l'exactitude de ses observations et à la véridicité de ses récits" (Biographie universelle, Vol IV, 1811). The author's spelling is retained in the above quotation.

1 Explained by E. LITTh (Dictionnaire de la languefrançaise) as "ivoire des morse", de l'hippopotame. HIST. XIVe siècle. Un coustel à un vieil manche de rohart, DE LA- nởRE, Emaux, p. 486. XVe siècle. L'ivoire et le rochal et les pierres précieuses, Du COX, rohanium (où il interprète, probablement à tort, rochal par cristal de roche). XVIe siècle Par quoy luy en fait adapter d'autres [dents] d'os ou ivoire, ou de dents
est droitement 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'auôs 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 cet effet, Pâre, XVII, 3. ÉtM. Probablement, corruption de roquval." The latter word refers to a species of whale and is explained, after Cuvier, from Swedish rer ("tube") and qual ("whale"), "baleine à tuyaux, à cause des plus de la peau sous la gorge et la poitrine." In the Supplement is added Bugge's etymology from rokal, roshal, Norse hrosahval, 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 Belonii Cenomani, Plurimorum singularum et memorabilium rerum in Graecia, Asia, Aegypto, Judea, Arabia, ulterioris provinciis ab ipso conspectarum observationum, tribus libris expressae C. Claudius Atrebus e Gallicis Latis in faciebat, p. 395 (Antverpiae, 1689).
4 In the same manner the word morse (morse) has been interpolated in the early English translations of Othoère's Anglo-Saxon account, where only the term hors-huæl ("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 scimitar 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

\(^1\) Behemoth בְּהֶמוֹת, the Hebrew word used in the Old Testament (Jon, xl, 10) for the hippopotamus of the Nile, and presumably derived from Egyptian ḫ-e-h-m-n (“water-ox”). In Russian it is چرمیپر. VLADOMIR DAL’ (Complete Dictionary of the Live Great-Russian Language, in Russian, Vol. 1, 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. 307) 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, behemoth was applied in Russia also to the mammoth (Russian mammont, C. WITSEN, Noord en Oost Tatarye, p. 742), and P. J. VON STRAHLENBERG (Nord- und Ostliche Thail von Europa und Asia, p. 394, Stockholm, 1720) derived the word mammoth from Hebrew behemoth through the medium of an Arabic mehemoth. 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 behemoth 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 behemoth 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 mammoth is traceable to some language of Siberia, but this is not the occasion for a discussion of this subject.
WALRUS AND NARWHAL IVORY. 365

story told him by the Voyevoda of Smolensk about an island at the mouth of the great River Kawoina, 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 Behemoth, 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 māhī دندان ماهی, occurring in a Turkish work on precious stones by al-Gaffārī, written in 1511–12 and partially translated from the Persian Tūnṣūq nāmeh ʿilkhānī ("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-teeth ² and sent them on to India, as demonstrated by H. Beveridge in a highly interesting article ³ 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

² Termed also شیر ماهی "lion-fish," translated "dent de morse" by A. Benoît (Dict. persan-français, col. 246).
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 Akbarnäma, 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 worse 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' (mahlika-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,

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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 Tang period (pp. 324, 340). First of all, the passage quoted in the Man-chou yün 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 Tang. 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. KRAFENINTSNIKOV's Beschreibung des Landes Kamtschatka (p. 148, Lemo, 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 DAI (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 kū, 1890). The text is as follows: 土多貂鼠皮尾骨咄角白兎白鷹等
and intercourse with the Liu-kuei, a people briefly described in the *T'ang shu*. ¹ Schlegel ² 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 Kraseniunikov, on which our knowledge of the ancient Kamchadal or Itelmens 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 (*T'oung Pao*, Vol. IV, p. 338) from the *Piensien*; it agrees with *T'ang shu*, except that the latter reads 少海之北 in lieu of 北海.


³ Schotti (Kirgisen, l. c., p. 448) was the first, though somewhat hesitatingly, to connect the Liu-kuei with Kamchatka.

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 in Liao-tung is stated to have consisted of ginseng, musk, leopard tails and skins, and ku-tu 骨. The reading of the latter character is certain, being explained in the T'ang shu shi yin (Ch. 4, p. 2 b) as 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 骨, 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 Ta'in, being 3000 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 Yu yang 渔陽; in 717, with the administration of Liu ch'êng 柳城. In 742 the name was altered into the latter. See chiefly T'ai p'ing huan yi ch, Ch. 71, pp. 4 b et seq. This work enumerates as products of Ying chou only leopard tails, musk, pongee 絎, 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 (Osteuropaische 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 Khitayin ختیامن 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, Kukunor, and the high mountains of Szech'uan, Kan-su, and Shen-si.

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

128
so that this ku-tu apparently refers to a product of osseous nature. It comes from the region of the Khitan, or, in general, from the domiciles of Tungusian tribes, 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 骨啮, further, appears in the Tang Annals as the designation of a wild animal living in the country of the Kirgiz (Kie-kia-se 雌戛斯). The passage runs thus: "Among the animals of this country, there are wild horses, 

* Turkish kəmik means "bone" and "ivory" (Radloff, Wörterbuch der Türk-Dialekte, Vol. I, col. 1208).
* According to the T'ai p'ing huan yü hsü (l.c.), the Shi-wei, Mo-ho, and other tribes were settled to the north-east of Liao-ri at a distance varying from two to six thousand li.
* Tang shu, Ch. 217 T, p. 8. Professor Hirth has been kind enough to call my attention to this passage.
* I do not think that this name is to be read Hia-kia-se, as maintained by Klaprotl (Mémoires relatifs à l'Asie, Vol. I, p. 164). Since the name Kyrkys 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, which was formerly possessed of initial k and final t (Japanese katen). Also the writing Kie-ku 結骨 (kat or kyt kat) is doubtless intended for Kyrkys. 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-seu 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. Pozdneev maintient la tradition, sont deux idoles libres dont nous sommes redevables au P. Hucien lui. Le P. Hucien avait en réalité forgé ces noms sur les transcriptions chinoises Kie-kia-seu et T'ou-kia; mais ces transcriptions représentent simplement Kirgiz et Turk; les Hakas et les Dulgha n'ont jamais existé. Kien-kouen paraît transcript sur une forme *Qirgu, singulier répondant au pluriel Qiryud qu'on trouve dans les textes mongols; Qirgu (Kirgis), qui se trouve déjà dans les inscriptions de l'Orkhon, le χεργς de Ménaudre, n'est lui-même vraisemblablement qu'une autre forme du même pluriel. — P. Pelliot.]

* 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 *shuang*  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 Geoffrey Saint-Hilaire and E. Hahn (‘Haustriter, 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 Kam-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. h. 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 wealth of horses is emphasized, it is most unlikely that wild horses still occurred, and the term *ye ma*  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 Curnow, 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  鄉羊 nguan ti (see *T'oung Pao, 1914, p. 71*).

2  W. Schott (*Über die achten Kirgisen, A. B. A. W.*, 1865, p. 433) omits the ku-tu (so Jores E. H. Parker, *A Thousand Years of the Tartars*, p 265) 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 Vischer (in *d'Herbelot, Bibliothèque orientale, Vol. IV, p. 174*) has given the series complete (he transcribes khou-thou) For the black tailed deer the *Ts'ai-p'ing huan yu ki* of Yu Shi gives the native word *se-mu* 已沒, which Schott (p. 471) identifies with *sim* 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 *sámur* is a well-known Turkish
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-Berünî's words, that it is asserted in regard to khuta (chutow) خُتْرَة 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, the whole question seems to assume a new turn. It is possible, as stated (p. 354), that al-Berünî'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 (Radores, Wörterbuch der Türk-Dialekte, Vol. IV, col. 511), used likewise by the Arabs, semmür (for instance, in Dimčki'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 houam yu ti, ch. 199, fol. 15 v.—16 r.: de l'éd. de Naskin, 1882 (sur laquelle cf. B.E.F.E.O., I, 338—339); il est bien conforme aux indications de Schott. Il est clair que phonétiquement la restitution de M. Lauffer 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 tm, 己 yi et 己 zeen; l'analogie de la transcription bûx-ai, "premier mois", par

衰 mao-che-mouais dans le même texte et l'emploi de 沒 pour rendre bol (bolmil) sous les Tang permettent en outre de songer à une forme en 6 au moins autant qu'à une forme en m. — P. Pelliot.] 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 Antilope subsquisitiroa; Pallás (Zoographia rosso-asiatique, p. 232) records this term in the form kara-kuruk 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 Uryankhayans on Lake Terkul and referring to Cerus 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, I, 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-chén, in his discourse on the seal (wu-nu shou 骨痂獸), 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” (按唐書云骨痂獸出遼西營州及結骨國). Hirth ¹ 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-chén's opinion is apparently based. Li Shi-chén, accordingly, makes two points: he combines the ku-tu 骨痂 of Ying chou with the ku-tu 骨痂 of the Kirgiz, and identifies both with the animal ku-nu 骨痂. 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 骨痂. Palladius (Dictionary, Vol. I, p. 436) writes 骨痂, and states, “name of an animal from the dominion of the Kien-kun (Kirgis).” 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.  

As to the Khitau word t'u-hu, M. Pelliot (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 (其束带日吐糯 "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. Pelliot (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; 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 Kin 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. 95, p. 16 b) the animal ku-tu, together with panthers and rodents, occurred also in the country of the Yu-che, while the T'ang shu (Ch. 217 F, p. 7 b) locates there only an abundance of sables and rodents. The Yu-che territory was situated fifteen days' journey eastward from the country Kui (identical with the Wu-hun), the latter six days' journey north-east of the Pa-ye-ku (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. PELLOT (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, 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 壁璣 (that is, precious stone)."

The term kuo hia ma 果下馬, 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 hui yu heng chi 楠海虞衡志, 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 灏木 in the prefecture (now chou) of Té-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 靳慶, Lung-shui being given as the place of their provenience.
There is a term of the Chinese language, *k'uei* or *k'ui* 犀, for which the translation "walrus" has been proposed. 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 *Palladius* interprets it in the sense of a "spirit resembling a dragon, with a single foot." *Couvrard* 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. *Wisek* defines *k'uei* as a fabulous animal. The *Pi'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

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1 Written in various other forms that are recorded in *Couvrard's Dictionnaire chinois-français*, p. 439.
2 *Glimm*, No. 6507.
4 *Pères du système taoiste*, p. 343.
through the medium of the Su-shên, Mo-ho, or other northern tribes.  

The snake-horn of the Khitan tradition (p. 318) was revived in a curious manner during the eighteenth century. The *Pên ts'ao kung mn 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 kung 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 潞嵐先生, in his work *Luan yang siao hia'lu 潞陽消夏錄*, tells a very fantastic story about a huge serpent once seen in Urumtsai 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

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1 In the journal *Kuo sui hio pao* 国粹學報 (Vol. IV, No. 2) there is a series of illustrations of animals after European models, identified with their Chinese names. The animal *k'uei* 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 *khulū* is that this tradition appears to have spread to Persia; for JOHNSON and RICHARDSON (*Persian-English Dictionary*, ed. STEINBASS, p. 448) assign to خنثي *khulū* 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 *tien* de 紀昀 Ki Yun, un lettré de la deuxième moitié du XVIIIe 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 Urumtsai et a même laissé une suite de poésies sur cette ville. Son *Luan yang siao hia lou* est l'une des œuvres qui composent son *閲徽草堂筆記 Yue wei ts'ao ts'ang pi ki*. J'ai lu jadis cet ouvrage, dont il y a peu à tirer, tant l'auteur n'y montre accessible aux contes les moins vraisemblables. — P. FELLIOT.)
rashly identifies it with the newly introduced poison-attracting stone. The editor of the work, Chao Hsi-min, justly opposes this view as incorrect by referring to the article *ku-tu-ni* in the *Pen 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 *Agastmata* (posterior to the sixth century); and according to Varahamihira (a.d. 505—587), a very brilliant blue stone is formed in the head of the serpent (L. Plin, *Lapidaries indiana*, p. xxi). 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, Steinbach aus der Kosmographie des al-Kazwini*, p. 13), who describes the snake-stone thus: "This is a stone called in Persian *mahrk-i-mar* [Villum, *Lexicon persico-latium* "lapis qui in oppifice serpentum repertur"], 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 opifice 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 (demonstrant ambo capitis dolores sedare adligati et serpentium iectus). This belief is solely inspired by the name of the stone (from ṣṭπ̣ī, "serpent"), caused by its being marked with streaks resembling serpents in appearance (serpentium maculis similis, unde et munem accept; compare our term "serpentine"). Pliny's text was adopted by Dioscorides (*V de Mîlly, *Lapidaries grece*, p. 36) and Ibn al-Baitar (*L. Leclerc, Traité des simples*, Vol. I, p. 418), whose "snake-stone," accordingly, is different from that of Qazwini. The classical and Indian notions are amalgamated in the Armenian *lapis durum* (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, Steinbach des Aristoteles*, pp. 147—149, and L. Leclerc, *Traité des simples*, Vol. I, p. 196) 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 Kostmographie, p. 29] and al-Akfiti [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" (P. Lauchert, Geschichte des Physiologus, p. 37). This stone is described as having the specific quality of sucking up the diseased matter of a dropical 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 (al. 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 dropay-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. 166), localized in India, is found in all versions of the Physiologus, and was already booked by Hommel (Aethiopsche Ubersetzung des Physiologus, p. xvi) as one of the instances of Indian influence on the Greek work. The name huan, mentioned for this stone in the Syriac and Arabic translations of the Physiologus (E. Perren, 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 huáng 蛇黄 (a counterpart of niú huáng 牛黄), "snake yellow." The statement of the Pén ts'ao (F. de Mélv, Lapidaire 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. Pelliot, Young 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. Kaemper Aeneidates exoticae, p. 395): its ductus lapis, vocabulo a Lusitanis imposito, adversus viperae radum moras praestat auxilium, externue 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, Tavener,
the Arabic accounts. In his study "Zur Mineralogie im Islam,"* which contains a translation of the mineralogical treatise of Ibn al-Akfaı̄r, E. Wiedemann has returned to the question of khutū (chutow ختنر), and is inclined to regard it as rhinoceros-horn, because al-Akfaı̄r, besides the word chutow, avails himself of the word chartūt, and because his informants in Egypt tell him that chartūt or chirrtt is still the name for the African rhinoceros. 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-Akfaı̄r is a late author, who died in 1347—48, and who depended entirely, in his statement regarding khutū, on his predecessor al-Beruni (973—1048). For this reason al-Beruni remains the oldest and the

Kaempfer, Tennent, and others. — (C'est le P. Verbiest (1623—1888) qui paraît avoir popularisé en Chine la "pierre qui attire le poison"; il a en effet écrit un article sur ce curieux oupsoule qu'il n'en fait mention ni dans l'Imprimerie sino-europeenne 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, écrivains chinois, Société d'Édition de Bruges, Mélanges, vii, Bruges, 1913, in-8°, et l'autre au P. H. Bossman, 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 le jade, ainsi que le fait M. Blochet, dans J.R.A.S., 1914, p. 168. — P. Pelliot.)

The results of my previous study have meanwhile been acknowledged by G. Fenand (Textes relatifs à l'Extrême-Orient, Vol. II, p. 679), J. Ruská (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 chutowe and chartuf 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 chutuw.

* Published in S.B. P. M. S. Erlg., Vol. XLIV, 1913, pp. 205—266. 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.

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pre-eminent Arabic authority on the question. Al-Akfāni 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-Berūni does not offer the term khaṛtūt, which is plainly an addition peculiar to al-Akfāni, 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-Berūni, in his account of India, shows himself closely familiar with the rhinoceros of India as well as with that of Africa. 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. In this description, however, he does not allude to khutū, nor in his notice of the latter to rhinoceros. 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. Only a scribbler or copyist who

2 See the writer’s Chinese Clay Figures, p. 95, note 6.
3 Regarding the Arabic names of the rhinoceros, see M. Reinaud (Religion des voyages faits par les Arabes et les Persans, Vol. II, p. 66), F. Hommel (Namen der Saugetiere bei den semitischen Völkern, pp. 332, 382, 395), and G. Ferrand (Testes relatifs à l’Extrême-Orient, p. 675). No Arabic author has ever used the word khutū with reference to the rhinoceros.
4 Ivory and rhinoceros-born are substances of radically distinct biological origin and structure, which do not have a single trait in common. Rhinoceros-born 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-Akfání. This is evidenced by his interpolation that khutá, 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 khutá 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 khutá designates rhinoceros-horn. The passage of al-Akfání, 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-Akfání has interpolated in the text of al-Berûni, 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. Groeneveldt appears to have been the first to call attention to it in studying a text of the Ying yai shéng lan of 1416 relative to Palembaug on Sumatra, where a bird called “crane-crest” hao t’ing 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
identification of the bird by observing that it is not a crane, but
the buceios, characterized by a large beak, with an excrecence 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 ornaments are cut out of it. The current name of this
bird is now siang 豱. The Bucerositidae form a large family of
tropical birds, distributed over India, Ceylon, south-eastern Asia,
and the Archipelago, and characterized by the extraordinary develop-
ment of a horn-like excrecence 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. 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 Notes 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.

1 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.

2 Compare F. H. Knowlton, Birds of the World, p. 507 (New York, 1909); Ency-
clopedie van Nederlandsch-Indie, Vol. III, p. 15; and chiefly the fine monograph, illustrated
by colored plates, of D. G. Elliot (A Monograph of the Bucerotidae 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
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 t'ai ch' eng (XIX, 42). The earliest text quoted there is the Nan Yüe shi 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 鳥), and has on its upper mandible an excrescence (呞末) which has a capacity of over two pints (升). The southerners make wine-vessels out of it,

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 輯慶府 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 t'ai ch' eng, XIX, 41, p. 1). According to Schlegel (T' ung Pao, Vol. X, 1899, p. 451) "birds of the King of Yüe" are attributed to the country Tan-t' an 丹丹 in the T' ung tien 通典 of Tu Yu 杜佑 (regarding this country compare Palliot, Bull. de l'Ecole francaise, 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-ia 椰子) is known under the term "head of the King of Yüe" (Yüe wang tou 越王頭), because the latter, in a feud with the King of Lia-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 ti' ao 南方草木狀, Ch. a, p. 8, ed. of Han Wei ts' ang shu; and Bartschneider, Chinese Recorder, Vol. III, 1871, p. 244). In a study on La coco du roi de Yen et l' arbre aux enfants (Transactions of the Ninth Congress of Orientalists, London, 1898, Vol. II, pp. 897—906), Thomas de Lacouperie has endeavored to correlate the story regarding the head of the King of Yüe with the well-known tale of the tree of the Wiqwiq.
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. Its guano resembles the incense hün-lu 薰 香, 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 木 terms the bird mung tiao 棕鷄, 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."

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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 P. Hai). 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 zoology and animal-lore.

4 Chinese mung and mung-tung (of the Kiao chou hi) are apparently the reproductions of a Malayan name. In the language of the Dayak of Borneo, the bird is called bungai and tinga (A. Hardeland, Daisaksch-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, Java, Vol. III, p. 282), furnish the foundations of the Chinese transcription. As the phonetic element was anciently *bun (Japanese わん), the word 雛 may very well have reproduced the syllable bun of some Malayan term of the type of Dayak bungai (bunai). 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 (Gronkh-Klot, I. c., p. 231; Ming shi, Ch. 355, p. 1). — The phrase mung tiao would mean "hornbill carvings," but is presumably to be corrected to 雕 "eagle," as shown by K'ang-hi's 雕雕, thus written likewise in the Yu yang tea 木.

144
Li Shi-chén, in his Pén ts'ao kang mu, annotates, “According to the Kiao shou ki 交州記, by Liu Hin-k'i 劉欣期,  the bird mung-tung 鶴鶴 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, the bird of the King of Yüe is shaped like a black kite, with long feet, and has on its upper mandible an excrecence 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 Shén 楊慎 (1488—1559), in his Tan k'ien lu 丹鉛録, states that the bird mung-tung is identical with the one now styled hao ting 鳴頂.” The Chéng tse t'ung 正字通 does not contain much that is new. It quotes the T'ung ya 通雅 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 鶴雕, referring to the large size of the bird, and this is now the character in vogue for it.  

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1 According to BERTSCHNEIDER (1. c., p. 159), “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 Chén 草真 (see BERTSCHNEIDER, 1. c., p. 179). The Lo-fou Mountains in Kung-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 1664 (Wylie, Notes, p. 168). 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 tsi 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 role in the religious beliefs of the Malayans. It is no less certain that al-Akfas'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 radinoceros 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 pejas and grepae, 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 horn on the temples, and a plumage of iron color, while only the head is purple (Equidem et tragopana, de qua planes adamanat, maiorem aquis, cornus in temporibus curvata habetem, 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 Encyclopaedia 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 (faisam cornus) 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 Himalayas, chiefly in Nepal 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." Those lateral flesby protuberances perfectly answer Pliny's description. The bird is now termed Ceriornis satyræ; 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 K "horn pheasant," accompanied by 'Tibetan name bya p'o p'od-kan; the proper Tibetan designation seems to be p'or-loh (Sand-hiero, 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-rigok-fo (Mainwarin-Grümmedel, Dictionary of the Lepcha Language, p. 119), and are likewise acquainted with two species of hornbill, — ka-hlet-fo and ka-grom-fo (ibid., p. 468).
the mystery that al-Akfar places the hornbill on the same level as *khutu*, and possibly rhinoceros-horn, to be explained? This problem is as follows: the Malays entertain the belief that horn-shavings 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 *khutu* 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 *khutu* 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}\text{H. V. Stevens, Materialien zur Kenntnis der wilden Stämme auf der Halbinsel Malaka, II, p. 134, note 3 (Ver. Mut. Volk., Vol. III, 1894). This explanation of the matter renders intelligible also the following entry under خنثيَي 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-Akfar'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 *khutu* as a “Chinese bird” presents one example. Further we read in Damiri (translation of *Jatakas*, Vol. I, p. 667) about the bird *al-khataq* 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-Akfar 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-Berūnī, who does not know rhinoceros-horn, either, in this connection. The latter is as secondary as the hornbill; and consequently the khutū of al-Berūnī 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 l’ung defines the term hai ma as the designation of a fish or seal (yū) 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. 9, p. 5; ed. of Chi pu tsu chai ts’ung shu).

P. 385. Also the Ling piao lu i (Ch. 9, 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 Turquois 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 Altyntau 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 Karatau, 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 Sarmarkand; 4. in the locality Bir'uzu-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.

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 Bokhara.

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

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 cyclopedia 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 focusing 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. Layard ¹ (1845) discovered
in the palace of the Assyrian King Ashur-naṣir-pal (885—860 B.C.)
at Nineveh a rock-crystal lens of plano-convexity, 1½ inches in
diameter, with a focus of 4½ 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 ad-
mitted 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 (Νεφελαι), 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 Zeit, col. 607.
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.
OPTICAL LENSES.

I've hit the nail
That does the deed, and so you will confess

Good chance but you have noted
A pretty toy, a trinket in the shops,
Which being rightly held produceth fire
From things combustible —

You are right; 'tis so.

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 fume!

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 (λιθος διαφανὴς ἀφ' ἦς τὸ πῦρ ἀπτομεῖ); and what Socrates in the above translation calls a burning-glass is in the Greek hyalos (ξυλος). 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" (λιθος χυτὴ) 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 ξυλος in the description of the coffins of the Ethiopians, where it most evidently has the significance of "rock-crystal" or some other

² M. H. Morgan, De ignis eligiendi modis apud antiquos (Harvard Studies in Classical Philology, Vol. I, 1899, 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; 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." If οξχας 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," as J. H. Frere translates with perfect correctness; where Blümner, Morgan, and others, however, see the first mention of glass vessels in Greek records. 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 οξχας 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 οξχας ὑψωματικόν.
3 Ἐξ ὑπάλληλον ἐκποιήσατον.
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;" 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, 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.) 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

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1 This interpretation is adopted by Liddell and Scott in their Greek-English Lexicon.


3 De lapidibus, V, 80 (opera ed. Wimmer, p. 345, Paris, 1866). This fact is indicated also by Krause (Pyrgoteles, p. 16) and Schrader (Realesikon, 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 (Hancock, Mesopotamian Archaeology, p. 287) and among the intaglios of the Minoan, Mycenaean, and archaic Greek periods (D. Osburn, Engraved Gems, pp. 25, 283). On rock-crystal among the ancients, in general compare L. de Lahunay, 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 cauteries, and assisted in enlightening the text of Hippocrates on p. 130.

2 ἔξωτοις ἢ ἐπὶ τὴν όλην καὶ ἐπὶ τοῦ χελικοῦ καὶ τοῦ ἐξηλαμμον τροποῦ τῆς ἐξηλαμμάτων (De ign., 73; opera ed. Wimmer, p. 363). Others cancel the words ἐπὶ τὴν όλην and interpret the instruments as concave mirrors (Morgan, l. c., p. 52).

3 Invenio apud medicos, quae sunt urcada corporum, non altiter utinam quin putari quam crystallina pilula adversa opposita solis radia (xxxvii, 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 Ἀἰσιχαί 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

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1 Cum addita aqua vitrearum pilae sole averse in tantum candescant, ut vestes exurant (xxxvi, 67, § 199).
2 Orbem vitereum plenum aquae si tenueris in sole, de lumine quod ab aqua refugiat 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 praebeat (Origines, xvi, 13, 1). Fungi used in cautery are mentioned by Hippocrates and Paul.
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 Lessing 2 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. Marquardt 3 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

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1 *Litterae quamvis minutae et obscurae per vitream pilam aqua plenam maiores clarioresque cernantur* (*Quaestiones naturales*, 1, 6, 5).
2 *Briefe, antiquarischen Inhalts*, No. 45.
3 *Privatleben der Römer*, p. 75.
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 mediaeval 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. In § 41 of his work, Marbodus makes the following observation on crystal lenses:

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

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), who attempted to analyze the operation of a burning-lens. But Bacon’s essay is dependent on that of the Arabic physicist Ibn al-Ha{ıt̲am (or Alhazen, 965–1039), who treated the problem much more profoundly and scientifically.

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
tient el rai del soleil, | E de cel fou li tondre esprent | S’il i tuchet alques sovent.”


4 Compare S. Voué, Physik Roger Bacos, 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-lens as a substitute for a match (Horniman Museum and Library, Handbook on Domestic Arts, I, p. 36).
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 encyclopedist 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 Lapladers 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. Schepfer, Lapidarium, p. 416, Frankfurt, 1675). Also in the prehistoric age of northern Europe, quartzites served for the production of fire (compare the interesting study of G. F. L. Samson, 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.)


³ Ruska, Steinbuch des Aristotelis, pp. 170, 171. The Latin text runs thus: “Bonitas huius lapidis est quod quando exponitur soli rotundatus ut radii solares penetrant 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

Reputation 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. Hill 2 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 (11, 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

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 Mémoires 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 stoucs 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 unchangeable." 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.
3 Ch. 5, Tang wen (compare E. FARKES, Naturalismus bei den alten Chinesen, p. 104; L. GILES, Tauid Teachings from the Book of Lieh Tsê, p. 85; L. WIEBE, Les pêres des systèmes taotiste, p. 131).
4 P’ei wen yun fu, Ch. 21, p. 217.
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. Mayekas\(^1\) 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'uang,\(^3\) in connection with a fire-making apparatus for

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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." 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 夫燧 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.

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 Nu-kua legend; his term wu shi 五色石 in this passage being merely a loose expression or abbreviation for wu ze 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. Hermes in Hanau: the quartz utilized was melted in vessels of pure iridium, which melts at 2000º, while the melting-point of quartz is at 1700º. 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, "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 misinterpretation of terms. Biot, Schlegel, Hirth, and Chavannes 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 Nu-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: "On the northern side of the Hen Mountains, along the

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1 Chinese Recorder, Vol. VII, 1876, p. 43.
3 Uranographie chinoise, p. 612.
4 Boas Anniversary Volume, pp. 226—227.
5 Le Tai Chou, pp. 188—189.
6 Compare CHAVANNES, Tommy Fau, 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 shì p'ū 雲林石谱" by Tu Wăn 杜绾 of 1133 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-nau 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 Chén-chou 襄州. 3

Another tradition crops out in the Gazetteer of Lai-chou 襄州志, 4 according to which the district of Ye 抚縣, forming the prefectoral 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" (kuaǐ shì 怪石) mentioned in the Tribute of Yū. 5 This stone of Lai-chou is well

1 Ch. x. p. 5 (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-nung, province of Kiang-su. According to Tu Wăn’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 Lege, Chinese Classics, Vol. III, pp. 102, 104; Couvreur, Chou king, p. 67; compare Ts'ien Han shu, Ch. 28 a, p. 1. Legge remarks that the "strange stones" are very perplexing to the commentators, and that Tu’s 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. Its tinge 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-ch’ou stone of diverse colors, neatly cut out and mounted. The stone being very soft, carving is comparatively easy.

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 五色石, 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. 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


2 T. de Lacouperie (Toung 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, 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." 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. Hirth has indicated a jade mirror found in A.D. 485 in an ancient tomb near Siang-yang in Hupei Province, which the polyhistor Kiang Yen (443 - 504) stated to date from the time of King Suan (827 - 782 B.C.). The Yin lin shi pi'au mentions two localities where stone material fit for mirrors was quarried, -- Mount Wu-ki, in the district

1 Forke, Lan-king, pt. 1, p. 252.
2 This passage is quoted also in P'ei wen yün shā, Ch. 100 A, p. 16.
3 Chinese Metallic Mirrors (Hons 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 邑安, 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 Schlegel 2 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.

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* 卯青日札.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-héng, a writer of the Ming period.
² Ch. 3, p. 2 (edition of *Huai 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. 21; Ch. 8, p. 1; 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-chêu, 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 kung mu, has summarized his knowledge of optical lenses (huo chu 火珠, "fire-pearls") as follows: 1 "The dictionary Shuo wén 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 Sù Han shu 續漢書 4 says that the country of the Ai-lao barbarians 5 pro-

1 Pên ts'ao kung 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'Hermelot (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-chêu'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 虢牢夷. 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 Yun-nan.
duces stones styled huo-tsing 火精 (‘fire-essence’) and liu-li 琉璃. In view of this fact, the term huo-tsi 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)." It will be seen from the following discussion that this notice is very inexact in detail, and altogether highly uncritical, — a defect for

1 P. De Mely (Lapidaires chinois, p. 60), who has partially translated this text (not from the original, but from a late Japanese cyclopaedia), gives wrong characters and transcriptions of the Chinese terms, — kiu kui instead of mei hai (or mei kai, or mei kui; see farther below), and ho chai in lieu of huo tsi. 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-tsi, as assumed by Li Shih-chén, 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 (Wu Li siau shi, Ch. 7, p. 13): huo-tsing and huo-tsi, 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 **opp. cit.** to Pliny (XXXVII, 9, § 22), who takes crystal for a kind of ice due to excessive congelation, found only in regions where the winter snow freezes most intensely (Contraria huc causa crystallum fact, gelo vehemenciori concreto. Non aliubi certe requiritur quam ubi maxime hibernae uves rigent, glacieaque esse certum est, unde nomin Graeci dedere), Diiodorus 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 glacie indurata coalescere iacet, non quidem a frigore, sed divini ignis potentia). The celebrated French Bishop Manouzou (1035—1123) attacked the glacial theory in his poem De lapidibus pretiosis (§ 41) as follows: "Crystallus glacies multos durata per annos, Ut placat doctis, qui sic scripsero, quibusdam, | Germania antiqui frigores tenet atque colorem. | Pars negat, et multis perhibet in partibus orbis | Crystallum usci, quod non vis frigoris ulna, | Nec glacialis hicun quaquam violasse probatur." In China, the same theory was called into doubt by Tu T’ao Chao 曹昭 in his Ko ku yao 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" ( 多年老冰為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-chén 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'í-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 wén nor the Han Annals speak of burning-lenses; Li Shi-chén, 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’í 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-chén does not claim any knowledge of them on the part of Wang Ch’ung or Hui-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 Pén ts’ao kang mu will now be discussed in detail.

HUO-TS’Í NOT A BURNING-LENS, BUT MICA. — The earliest definition of the "fire-regulating pearl" (huo ts’í chu 火齊珠)\(^3\) that occurs

\(^1\) Notes on Turquoise in the East, p. 28.
\(^2\) HANH and ROCKHILL (Chau Juk-kua, p. 113) express the opinion that huo ts’í 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’í is good Old Chinese, and yields a reasonable sense. It occurs in the ancient Book of Rites (Li ki, chap. Yü-ling, ed. CUVREUX, 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’í 火齊) be right.” The term huo ts’í chu, accordingly, is very well fitted to signify “a pearl (or gem) used in regulating fire.” Indeed, the term huo-ts’í, 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 i ki, Ch. 5, p. 6; ed. of Han Wei ts’ung shu), couches, and finger-rings of huo-ts’í, 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, which enumerates it among the products of Central India,
and describes it as follows: "Hu-o-ta'i, in its appearance, is like the
mica of China, 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." This
text, however, is not peculiar to the two Annals, but is

1 Liang shu, Ch. 54, p. 71. 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 Nao shi (Ch. 78, 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 speci-
men obtained from China, yün-mu was identified with mica by E. Biot (in Pauthier-
Bazin, China moderne, Vol. II, p. 551), who also rejected Reinmuth's interpretation of this
term as "mother-o'-pearl" (this meaning is erroneously given by Palladam, 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 Gérard (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 tale, though describing mica under that title. G. Schlegel ( Yong
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 tale," it cannot be
strongly enough emphasized that mica and tale 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 Tokyo, Vol. XIX, 1912, p. 413), while tale
is hua shi or si-tsao 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 abhara, a word appearing as early as the fifth century in the Bower
Manuscript (A. P. R. Hoenkle, The Bower Manuscript, pp. 11, 117). This word means
literally "cloud, atmosphere," and thus presents a curious counterpart of the Chinese de-
signation 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。積之則如紗穀之重沓也。
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 Chén 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 anualist. 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 lamellae (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 indigenous in many places of China; and a contemporary of Wan Chén, 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 Chén lived in the time of the Wu dynasty (third century).

² 火齊出天竺國 (*T'ai p'ing yü lan*, Ch. 609, 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 *P'ien ts'ao kung mu* (Ch. 8, p. 18), in the notice of *liu-hí*, 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.

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

Huo-t'ai are referred by the Chinese also to some countries located in south-eastern Asia. In the year 519, Jayavarman, King of Fu-nau (Cambodia), sent an embassy to China, and offered pearls of that description, saffron (yū-kin), storax, and other aromatics. In 528 and 535 two embassies arrived in China from a country called Tau-tan 丹丹, and huo-t'ai pearls or beads were included among the tribute-gifts of the latter mission. 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 Wa comprised the present territory of Kiang-nan, Chê-kiang, and parts of An-hui, this locality must have been within the boundaries of these provinces.

2 西亜縣有火齊如雲母。重沓可剖，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 金星石 ("gold star stone") or 金精石 金精石. See GEETS, *Produits de la nature japonaise et chinoise*, Vol. II, p. 430; D. HANDBURY, *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 T'i'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-nai) as producing mica (yūn shū).

4 Liang shu, Ch. 54, p. 6; or Nam shi, Ch. 78, p. 4 (compare PELLLOT, *Bull. de l'Ecole 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 Liang history, without adducing any evidence, rendered the term huo-ts'ì by "Labrador feldspar," which is an arbitrary and unwarranted opinion. ³

Both Fu-nan and Tan-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'ì gems were undoubtedly derived from the same source.

Aside from India, Fu-nan, and Tan-tan, huo-ts'ì 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'ì 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-lu'i.

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

¹ "T'ang shu, Ch. 222 a, p. 4 (compare Pelliot, Bull. de l'École française, Vol. IV, p. 284).
³ Schlegel's view that the country Tan-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 Pelliot (I. c.).
⁴ India traded diamonds with Ta Ts'in, Fu-nan, and Kiao-chi (T'ang shu, Ch. 221 a, p. 102)
⁵ Pei shi, Ch. 97, p. 7b; Wei shu, Ch. 102, p. 6b; Sui shu, Ch. 83, p. 7b.
⁶ Hirth and Rockhill, Chau Ju-kua, p. 16.
⁷ The conclusion of some Chinese authors that huo-ts'ì are burning-lenses may have been prompted partially by the report of a magic mirror (hue ts'ì king) contained in the Shi i ki (Ch. 3, p. 6b; 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-wu 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. 222) 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. Muscovite, a variety of mica, is still employed for lamp-chimneys, as firescreens 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,* 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'e-sü.

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

2 Kuang chou ki 廣州記, by P'ei Yuan 裴淵, who lived under the Ts'ing dynasty (265–419); see BRETSCHNEIDER, Bot. Sin., pt. 1, No. 377.
the district of Tsêug-chêng, when struck by the sunlight, emits a brilliant light.1

LIU-ŁI AND LANG-KAN NOT BURNING-LENSES. — We find also the opinion heralded by Li Shi-chên that the stone liu-li (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-yuan (in the prefecture of Sîngan, Shen-si Province), and who is the author of the Pen ts'ao sh'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 Chêng lei pen ts'ao 證類本草 of the year 1108, and in the Pen ts'ao kung mu. In both works he is quoted as saying that, according to the dictionary T'ai yün 集韻, liu-li is the same as the gem huo-ts'i. This work, of course, is not the T'ai yün which was begun in 1034 and completed in 1039, 2 but the T'ai yün or Yën ts'i by Lü Tsing 呂靜 of the T'ai 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'îng yü lan, Ch. 803). — 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 (gau), 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 Kukunor for the decoration of their fantastic head-dresses.

2 WATTERS, Essays on the Chinese Language, p. 60.
3 See the Catalogue of Sui Literature (Sui shu, Ch. 32, p. 22; and WATTERS, l. c., p. 40). T'ai p'îng yü lan (Ch. 809, p. 2) quotes the same definition from the dictionary Yën tsa 韻集, which presumably is a misprint for Yën ts'i 韻集.
4 This discussion bears out the reasons which induced F. PURSEY 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-crystal 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 Huei Shên 慧深 returned to China under the pretense 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 Sakhalin or on islands near Japan. But even this moderate attitude rests on a cardinal error, for Fu-sang, as described by Huei 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 yú 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.” 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.
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-saug itself is an imaginary construction. Moreover, the work which contains this story, and which consists of conversations held by the four Lords 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 Schlegel 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. Bretschneider 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.

(502—556),” written by Chang Yü 張說 (607—730), statesman, poet, and painter (Giles, Biographical Dictionary, p. 51).

They were Hwei-ch’uang 頗闊, Wan-kie 萬傑, Wei-t’uan 戴黃燁, and Chang-ki 仉軒.

1 T’oung Pao, Vol. III, 1892, p. 139.
3 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 inestimable 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 (碧玻璃镜).” ²

¹ Researches into the Early History of Mankind, pp. 250–253 (New York, 1878).
² G. Pauthier (L'inscription de Si-nyen-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.” Pelliot (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 catties 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. 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. I, 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 *pi'-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 *Tu shu ti ch'eng*, 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'ien ti 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 *Tai p'ing yü lan*,
Hirth and Rockhill understand that the junk 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 kang tuw ki* is not a work on commercial geography summarizing general data,
but is 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'-li* should be
regarded as a word-formation prompted by analogy with *pi-lu'-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 Devaraja of the Rūpadhātu. On felicitous and joyful occasions, he causes the trees of the gods 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.'

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 Brahmānic worlds. The detailed discussion of this subject in the part of O. FRANKE (Chinesische Tempelinschrift, pp. 47—50) is especially worth reading. The Devaraja here in question is Kubera or Vaiśravaṇa, God of Wealth, guarding the northern side of the world-mountain Sumeru and commanding the host of the aerial demons, the Yaksas.

2 天樹. This term corresponds to Sanskrit devatārūpa, 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璃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。問其價約錢百萬貫文。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。藏中肉煬類寶一。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 Constantinople, 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-lin. 5 In a northwesterly direction from

1 Epiphanius opera, ed. Dinorphy, Vol. iv, p. 190 (Leipzig, 1852). 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. XXIII, 1913, p. 196.

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 Chayannes (T'oung Pao, 1904, p. 38) in a text of 607, extracted from the Ti'fe fu yün kuei. The same way of writing occurs also in Yu yang tsa tsa and in a poem of the T'ang Emperor T'ai-tsung (P'ei wên yün 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 Pellyer (Journal asiatique, Mars-Avril, 1914, p. 498), that the name Fu-lin appears with certainty about 680, 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 Devaraja 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 neutral 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

¹ 梁四公記。梁天監中有蜀杰公誌武帝嘗與諸儒語及方域。西至西海海中島方二百里。島上有大林。林皆寶樹中有一萬餘家。其人皆巧能造寶器所謂拂林國也。島西北有坑盤拗仄千餘尺。以肉投之。鳥簡寶出大者重五斤。彼云是色界天王之寶藏。
product of Syria (Fu-lin) and reached China possibly by way of India and Cambodja (Fu-nau), in the same manner as the costly mirror of rock-crystal.  

A product termed lang-kan 琉玕 is identified with huo-ts'i  by Su Kung 蘇恭 of the T'ang period,  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.  

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

2 Ch'ên lei pên ts'ao, Ch. 5, fol. 26. Also in a commentary to the dictionary Kî ts'iu p'ien 急就篇 (P'ei wên yün fu, Ch. 7 a, p. 106 b).  

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. 11, 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 Shu wên defines lang-kan as a stone resembling jade; and the Erh ya localizes it in the K'un-hu. The P'ie lu 別錄 assigns the stone to P'ing-ts'ai 平澤 in Shu (Ssu-ch'uan). Wei liu, 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'i, describe lang-kan as a kind of coral, growing like a tree with root and branches on the bottom of the sea,筛查 by means of nets, and being reddish, when coming out of the water, but subsequently turning darker. The Yün lin shi p'lu (Ch. 6, p. 9 b) says that it is a stone caught in shallow places near the coast of Ning-po, resembling the genuine coral (shau-hu), being white, when coming out of the water, and afterwards turning purple or black. Li Shih-chên objects to the application of the term lang-kan to these marine products which, according to him, should be credited with the name shau-hu, while the former should be restricted to a stone occurring in the mountains. Compare also SCHLEGEL, T'oung Pao, Vol. vi, 1895, p. 88; F. DE MAIS, Lapidaires chinois, p. 50; HIRTH and ROCKMILL, Chau Ju-kua, pp. 162, 226. The word lang-kan seems to be an onomatopoetic 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-chén, also should refer to lenses. It first appears in the poem T'ie hui fu 子虚賦 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 晋灼 says that it is identical with huo-tsi' 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-tsi' 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-tsi' 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 K'i tsiu ch'ang 急就章, edited by Shi Yu 史游 under the reign

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

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. 9

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'üan 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, 8 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 CHAYANNES, 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. Schilden, 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-hsing of 1628 (24 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 (tsi ch' eng, 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.

188
became free to assume the same meaning as huo-ts'ı, 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, 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'ı 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 lü, written by Yü Huan between 239 and 265, as a product of the Roman Orient (Ta Ts'in), and worn on the high head-dress of the women of the King of the Ephtalites (Ye-ta).

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-leuses in China. There is only one term in the Chinese language which may lay claim to having this significance, and that is huo shu 火珠 (the "fire-pearl").

Introduction of Burning-Lenses into China. — The first historical mention of "fire-pearls" (huo shu) is made in the Annals of the T'ang Dynasty (618—906), where they are connected with a tribe of Malayau or Negrito stock, styled "Lo-ch'ıa" 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

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1 Ch. 79, p. 8.
2 Hsi, China and the Roman Orient, p. 73.
3 yap yang kiu lan ki 洛陽伽藍記, written in 547 by Yang Huan-chi (quoted in Tu shu ts'i ch'eng, Pien i tuen 67, Ye-ta, hui k'ao 2).
4 T'ang shu, Ch. 222 c, p. 1 b.
against the rays of the sun, mugwort and rushes will be ignited at once by fire springing from the pearl." The same text, with slightly varying phraseology, is given also in the Old History of the T'ang Dynasty, where, however, the interesting addition occurs, that this pearl is in appearance like crystal (状如水精). 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.

1 Chinese ai 艾, Artemisia vulgaris, a plant common in China and from ancient times used in cauterizing the skin (see Bletschneider, Bot. Sim., pt. 2, No. 429; pt. 3, No. 72), — a process known to us by the Japanese name moza (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 moza 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 Engelbert 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 moza.

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 morassey places. This pith they dip into sesame-seed oil, and burn the skin with it after the common manner.

多火珠。大者如雞卵。圓白光數尺。日中以艾藉珠輒火出。

1 Kiu T'ang shu, Ch. 197, p. 1 b.

2 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. Palliot (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. 291, but he too speaks of "lentilles de verre"). G. Schlegel (Young 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 of Ts’uei Pao 嗣豹 of the fourth century states that the latter served for the purpose of setting mugwort on fire.

The Annals of the T'ang 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. It is this text of the T'ang Annals which gave to Li Shi-chên 梁士誠 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; and in the passage of the T'ang 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.

Carbuncles (huo chu) which are like crystals. Carbuncles certainly are not like crystals, nor can they be utilized as optical lenses. C. Pumi (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 Trüm 亁舒).
A book entitled *Sui T'ang kia hua* 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.\(^1\)

The Lo-ch'a or Râkshasa, 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 Piên tê iê piên, Ch. 21, p. 5 b.
\(^2\) Chinese Lo-ch'a is the transcription of the Sanskrit word Râkshasa. 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 Groenewoldt and Schlegel that the country of the Lo-ch'a mentioned in the T'ang Annals is identical with the Nicobar Islands; but Pelliot (*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 Râkshas demons was Ceylon (Langka), which for this reason was styled also Râkshasilaya (“Abode of the Râkshas”); and as such, Ceylon appears in the great epic poem Râmâyana, in which King Râma combats these fierce devils of Ceylon. A country of the Râkshas plays a signal rôle in the Tibetan cycle of legends clustering around Padmasambhava, who lived in the eighth century (see E. SCHLAUENTWIT, *Lebensbeschreibung von P.*, p. 21; and LAUPER, *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 Rakshasa 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 Râkshasas had their residence on the Andamans, and the analogous application in India of the words Nâga and Pîpîsa). Indian traditions referring to Râkshas tribes, therefore, cannot assist us toward the identification of the Lo-ch'a country of the T'ang period, which, unjustly 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 “Râkshasa” on that primitive tribe in their proximity.
certainly were themselves not able to produce fire-making lenses. From what quarters was their supply derived? We are informed by the Annals of the Tang Dynasty that in the year 641 Magadha in India sent to the Chinese Court tribute-gifts among which appeared fire-lenses (huo chu), and further, that Kashmir produces fire-lenses, saffron, and horses of the dragon breed. The latter notice is contained also in the memoirs written by the celebrated pilgrim Hsuan Tsang in 646; and his statement, based on actual observation, was doubtless the source from which the official history of the Tang dynasty drew. The Arabic mineralogists also — as, for instance, al-Akfini — knew Kashmir as a country producing rock-crystal.

In the beginning of the period K'ai-yuan (713—742) Kashmir sent as tribute "pearls of supreme purity" (shang ts'ing chu) to China, illuminating an entire house with their splendor. Possibly 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..."
OPTICAL LENSES. 213

sparks of fire, the organs of the body, if these 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 Tsing, 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 Tsiüan 常駿 in the year 607 into the country Ch'i-t'ü 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 Nam hai ki kuei 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 (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 Tsing employed the term pai shi as a rendering of Sanskrit sitopalā ("white stone"), which is a synonyme of sphatika and accordingly a variety of quartz or rock-crystal (R. Garruf, 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 yu fang fa 服玉方). See Sui shu, Ch. 34, p. 21.

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. Man ¹ 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

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 chü 火珠, the term huo sui chü (“fire-igniting lens”) is found in the Ch'eng lei pên ts'ao, completed by T'ang Shên-wei in 1108. From the same work it follows also...
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 (其質如木，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 Ta'ang-k'i 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" (西國之寶也。玉石之類。生土中。或云千載冰所化。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. Tai p'ing yü lan (Ch. 808, p. 6) quotes a work Ti'en chu ti 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 (cōptaralma), 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 Ratnapariśkṣa, according to which rock-crystal is a product of Nepal (L. Pinot, Lapidaire indien, 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 ambur (T'ang shu, Ch. 221 a, p. 1); bis p'o-li certainly were a kind of rock-crystal, as also S. Lévi (Le Népal, Vol. ii, p. 164) understands, but not glass. The Buddhist monk Hui Ch'en 慧苑 of the T'ang period, in his Glossary to the Buddhavaśśana-sūtra (華嚴經音義, Ch. 1, p. 8, ed. of Show shan ko ts'ang 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. Moreover, Sanskrit agnimani, according to the Sanskrit Dictionary of Boehtlingk, is an epithet of the stone sāryakānta, which means "beloved by the sun," so called because it produces fire under the influence of solar rays. Other synonyms are tapanamani ("sun jewel"), tāpana ("dedicated to the sun"), diptopala ("refulgent stone"), agnigarbha ("essence of fire"), — all of these, as correctly seen by L. Finsen, referring to rock-crystal. A Hindu treatise on precious stones, the Navaratnaparīkṣā, 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 Hāng Hūan 恒玄). 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 煉寶 (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 Yū 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 Shī i 侶 (Ch. 5, p. 5 b; and Ch. 7, p. 2; ed. of Iam Wei) 侶 (Ch. 7, p. 5 b; and Ch. 7, p. 2; ed. of Ham Wei 侶 (Ch. 7, p. 5 b; and Ch. 7, p. 2; ed. of Iam Wei 侶 (Ch. 7, p. 2; ed. of Iam Wei); in one case the question is of an extraneous hairpin adorned with a fire-pearl dragon and a phoenix.

2 "Lapidaires 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. Garbe 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 Verchuck Udinsk in Siberia, Tvedestrand and Hittero in Norway, Statesville in North Carolina, and Delawaro 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 goethite, included in the stone, and which both reflect the light and give it a reddish color (FAMINGTON, 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 "out" 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.
OPTICAL LENSES.

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. Speckel, Arische Perioden, 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).


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. Barnek, 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 Diirrhapov (Susa, pp. 393 et seq.). The Avesta (Vidvadát, xiv, 7; F. Wulff, 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

200
In Sanskrit medical literature I have not yet found any reference to burning-lenses, but the employment of burning-mirrors in medical practice is well ascertained for ancient India. Such mirrors, probably made of metal, are twice mentioned in the medical work *Ashtāṅga-Hridaya.* 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 (Maundri, in B. de MÉYLAND, *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. 241–294; CHAVANNE, *Le Nestorianisme*, *Journal asiatique*, 1897, pp. 60, 61, 74, 75; PELLIOIT, *Bull. de l’Ecole française*, Vol. ii, pp. 669, 670). It could very well be conceived that the Persian Magi, who appear in India under the same Maus and in China as Mu-bu (*Mémoires concernant les Chinois*, Vol. xvi, p. 230; CHAVANNE and PELLIOIT, *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 Diodochoi, 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 *Sūrubā Sāṁhitā*, 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 Medicin*, 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

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

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" (fāi fa). The medium enlisted is a huge wax candle, styled thien ch'ai (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 fāi) 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

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1 The Hindi word corresponds to Sanskrit candrakīrti ("beloved by the moon"), in the same manner as does dīnyakīrti to the above Hindi name for the crystal lens. Candrakīrti is a kind of rock-crystal, generally believed in India to shed water when the moon shines on it (Pinto, Lapidaires indiens, p. xlvii). The Tibetan rendering of this term is ch'u del ("water crystal"), explained as "a fabulous magic stone supposed to have the power of producing water or even rain" (Jasche, 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-rgi or g-yang-fi (Polyglot Dictionary of K'īem-lang, 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 del ("fire crystal") or sreg byed del ("burning crystal"); likewise Lepcha mi žer or žer mi (Mainwaring-Grünwedel, Dictionary of the Lepcha Language, pp. 285, 434). According to H. von Schlagintweit (Reisen in Indien und Hochasien, 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" 戏术; 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 Gerini, Produits de la nature japonaise et chinoise, p. 243.

² Pén 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 appar-
ently native idea. Indeed, this text has been accepted in this
sense, and was marched forward by G. Schlegel ¹ 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 ac-
cess to Wylde’s Notes on Chinese Literature, from which we learn
(p. 192) that the work Po wu chi, originally drawn up by Chaug
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 Chaug
Hua. The text in question is quoted by Li Shi-chên from the
P’i ya 埠雅, 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 Chaug 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
Anuals of the T’ang Dynasty, as we noticed, record burning-lenses
in the possession of the Lo-ch’â as an entirely novel affair, de-
scribing their use and effect, and this incontrovertibly proves that
they were unknown in times previous. Neither do the T’ang

¹ Urunographie chinoise, p. 142; Nederlandsch-Chineesch Woordenboek, Vol. 1, p. 674;
and Ts’ing Fa, 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.
OPTICAL LENSES.

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 medieval 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, in mathematics, astronomy, and medicine, all of which have received an appreciable stamp of Western influence. 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 Malwa and Surashtra by Caudragupta II Vikramaditya 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 purijāta (see Fan yī ming i tī, Ch. 25, p. 27 b, ed. of Nanking).

P. 206, note. Compare also lamy-tang 琅瑯 and 銀鍍; an interesting notice on this word is contained in the Néng kai chi 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 Ignites Patui 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 xu chi without criticism.
A burning-lens is mentioned, and its utilization is demonstrated, in the story of King Virūḍhaka, contained in the Tibetan biographies of Buddha. This story was first disclosed by A. Schiefner from the Tibetan Life of Buddha, compiled in 1734 by Rin-chen Ṇos-kyi rgyal-po. When the cruel king Virūḍhaka had vanquished and slaughtered the Ḍakas, Bhagavat betook himself to Črāvasti, where he dwelt in the Jetavana, and predicted that Virūḍhaka 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 Ambarisha were seized by the flames, with loud cries for help [perished, and] were reborn in the hell Avīci. 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. Fehr, the relevant passage runs thus: “Sur ces entrefaites, le temps s'éclaircit, les rayons du soleil donnerent 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. 422): “When Virūḍhaka’s messenger came and told him what the Buddha had said, he was filled with trouble. Ambarisha 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 kiosque 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 Ėkajamuni’s, p. 69 (St. Petersburg, 1849).

advice, and retired to the kiosque with all his harem. On the seventh day, as they were preparing to return to Cāvastī, 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 Ambhariśa 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 Avadānakalpalatā (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’aḥ-pai rgyan la me śel yod-pa-la ni-mai mdaṅs p’og-pas rkyen byas | k’yim-la me sør-nas kun tu’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 ni-mai od-dag-gi sbyor-bas me ni rab-tu ́abar). 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.

Hūan Tsang, while visiting the kingdom of Cāvastī, 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


VIDANGA AND CUBEB.

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-t'ing-k'ie 竈澄茄. The translators of this author annotate that, according to the Pên t's'ao k'ang mu, this is a foreign word which occurs also in the transcription p'i-ling-k'ie 畢陵茄. 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 t's'ao as speaking of pi-t'ing-k'ie is Ch'ên Ts'ang-k'i 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, Bhûja). 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 t'ing and ling allows us to presuppose an initial cerebral in Sanskrit with the choice of a cerebral i in Prâkrit; the phonetic element t'ing 登 corresponds to ancient *tan and *dañ (for instance, in Mâtaṅga and dāmśhṭra), while ling renders lin, leñ, or lañ; k'ie 蓮 ("brinjal") has only the ancient phonetic value of ga, being the equivalent of ग, the classifier त्त (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 viḍāṅga, 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 p'i-ling-k'ie would justify the assumption of a Prâkrit form viḍāṅga or viḷeṅga, and in Bengali we have biraṅga (in Hindu-stāni baberūn, wawruñ; in Puṣṭu baṅbrañ). An Arabic form fiṭeṅga (see p. 285) likewise supports this view.

The word viḍāṅga is of ancient date: it occurs in the Śrūtra-saṃhitā and repeatedly in the Bower Manuscript (also in the form bidāṅga). This plant has been identified with Embelia ribes (family Myrsinaceae), 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

HORNER, The Bower Manuscript, pp. 301, 320.
employed as an adulterant for black pepper. W. Roxburgh states more specifically, "The natives of the hills in the vicinity of Siltet, 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 Pahorias of the Darjeeling district. 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 viđāṅga growing on Java with Piper cubeba (family Piperaceae). It was evidently from Sumatra and Java that the term viđāṅga was introduced into China together with the cubebes. 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 風伽 birds sent as tribute from Kaliṅga (訥陵, Java) to the Chinese Court in the year 813. The name pin-kia apparently is an abbreviation of Sanskrit kalaviśka, written in Chinese 迦陵 (or 羅) 風伽, 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, Hahang and the Lo-fou shao in Kuang-tung Province and Hongkong being given as localities (FOWLER and HEMSLEY, Journal of the Linnceian 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 Pèn ŭ’ào literature. Embelia ribes Burm. is found also in the Dutch East Indies (Encyclopaedie van Nederlandsch-Indië, Vol. II, p. 218: "De vruchten en een uit deze bereid werkzaam beginniz [embelia-zuur] zijn in den laatsten tijd in Europa als voortreffelijk lintworm-middel in gebruik genomen"). As regards Burmas, it is frequent in the tropical forests of Martaban and Upper Tenasserim (S. KURZ, 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. 63 (Calcutta, 1896).

4 This identification is due to D. HANDSBURY (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 T’ang shu, Ch. 222 B, p. 3.

6 Pan yi ming i tai, p. 20\(^1\) (edition of Nanking). Compare EITKE, Handbook of Chinese Buddhism, p. 67.
the Tibetan rendering *ka-la-piū-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 *kabūba*, whence our word "cubeb" is derived, 2 and discussed at length by Ibn al-Baitūr (1197—1248). 3 One of the

1 It is not known to me whether the word piūka or vińka 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 finc 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 *piū-ka* 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 Mūjavāhīt extended his power into those regions, as narrated in the Old-Javanese poem *Nisargakrītāgama* 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* 火鶏 [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 cubebu into our pharmacopoeia is due to the Arabic physicians of the middle ages.

earliest authors cited by him, Ibn al-Heitame, discriminates between two varieties, a larger and a smaller one, the larger one being habb al-ar'rus حب العروس, the smaller one falinjya or falenjya فلنجة. The latter kind is treated by Ibn al-Baitar, 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 cubébe 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 falenjya leave no room for doubt that the vegetal product in question is the vidânga of India. Arabic falenjya is merely a reproduction of this word, and the older Arabic articulation doubtless was filenga or filanga, which is in perfect harmony with the Chinese transcription pi-li (leh)-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 Chiên Th'âng-k'îi, 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 cubebas had entered India; for Ibn-Khordâibeh, who wrote between

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2. In view of the Arabic importation of both cubebas and vidângas from India and of cubebas 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 turcs 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-Baitar. It is gratifying, at any rate, that Ferrand calls the special attention of "indianistes, sinologues et indosinologues" 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.
6. The Dutch name staertpeper ("tail-pepper") presents a literal translation of Malay lada bârekor, or mariâ buntut.
844 and 848, enumerates them among the export-articles of India. 1 Li Sun
李蔚, the author of the Hai yao pên ts'ao 海藥本草 in the sec-
ond 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 Hind-
ustâni, Bengâli, and other Indian languages, cubebs are still called kabûb-tîni
؟کباب چبی; that is, kabab from China. 5
Garcia da Orta 6 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 excitandum venerem; tum etiam in Iaoo [Java] ad
excalfaciendum ventriculum. 7 Appellatur hic fructus ab Arabibus medicis Cu-
bebe et Quabeb; a vulgo Quabebechini: in Iaoo, ubi frequens nascitur, Cumuc; 8

1 G. Ferrand, l. c., Vol. I., p. 31.
2 澄茄生於海國乃嫩胡椒也 (according to another read-
ing, "the tenderest of black pepper" 胡椒之嫩者).
3 海南諸番皆有之.— Ibn Rusteh, who wrote about 903, mentions
cubebs as products of the island Salâhat in the Archipelago; Masudi, as products of the
kingdom of the Maharaja (G. Ferrand, l. c., Vol. I., pp. 79, 90, 110).
4 Finally the word pi-tông 畢澄 was transferred to a kind of wild pepper
山胡椒 growing in Kuang-sî, 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 Breitschneider, Rot. Sin., pt. 1,
p. 72). This work contains also an illustration of the plant; so does the Ch'üen lei pên
ts'ao (Ch. 9, fol. 44), where it is entitled "pi-tông-k'ie of Kuang-chou."
6 Latinized ab Horto. García 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
" Coloquio dos simples, de drogas e cousas medicinais, e assim daquas frutas achadas nella
India Oriental onde se tratam algumas cousas tocantes a medicina, pratica, e outras cousas
bans para saber." Only six copies of this original edition are said to be in existence. I
quote from the Latin edition of C. Clusius (p. 111), published at Antwerp in 1567.
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, praeter quam in Malayo, Cubabchini. Non est autem sortitus
hanc appellationem, quod in China nascatur, quandoquidem ex Cunda et Inoa,
ubi plurimus est, in Chinam perferatur: sed quoniam Chinenses, qui Oceanum
Indicum navigabant, hunc fructum, quem in iam enumeratis insulisemerant,
cum alis mercibus in alios maris Indici portus et emporia deservebant.” 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 impor-
tation 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 Cochinchenis, 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 Litsa 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 (Litsa pungens, Hems.), 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 viña García under No. 117 in the Tibetan transcription
byi-taṅka or byi-taṅga, 5 explained through Chinese man-king-tse 曼荊子
(Vitis trifolia), 6 a plant growing abundantly in northern China, and furnis-
hing a black berry which is used in medicine. Hence the adjustment with
viña García was effected: indeed, Chén Ts’ang-k’i remarks that the pi-t’êng-k’ie
(viña García), in their appearance, resemble the seeds of the mu-t’ung
梧桐 (Sterculia planifolia) 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’êng-k’ie

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1 Identical with Cunda, Sunda (see Yule and Burnell, Hobson-Jobson, p. 368).
2 Bretschneider, Early European Researches into the Flora of China, p. 171
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. POZDNÁVÁ’S УЧЕБНИК ТИБЕТСКОЙ МЕДИЦИНЫ
(Vol. I, pp. 247—301). A very poor and careless edition of it was published in 1913
by HÜGOTTER (Beiträge zur Kenntnis der ch’in. sowie der tib-mong. Pharmakologie).
5 Likewise in Mongol byidanga (the addition of the letter y, as in Tibetan, denoting
palatalized ģ). The word viña García is not contained in the Mahāvyutpatti, and it is not
known to me how old the Tibetan transcription is.
6 Bretschneider, Bot. Sin., pt. 2, p. 357; Stuark, Chinese Materia Medica,
p. 457.
碧澄 1 茄, with a Tibetan equivalent rin-po-che 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 Lamuist 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.

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1 If S. W. Williams and his successors transcribed this character ch'ing and ch'ing, 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 *čem*.
ASBESTOS AND SALAMANDER,
AN ESSAY IN CHINESE AND HELLENISTIC FOLK-LORE.

BY
BERTHOLD LAUPER.

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. Wylie 1 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. Wylie 2 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 Wylie 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. 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. 

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.  

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. 

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. 389 (New York, 1893).  
Asbestos in Classical Antiquity.—It is possible that Theophrastus (372—287 B.C.) makes mention of asbestos, although this name does not appear in his writings. He states, "In the mines of Scaptesylæ 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, 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 (Χειμαντρα) which, when soiled, are thrown into the fire, and whitened and cleaned, in the same manner as linen is washed." 3

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1 De lapidibus, 17 (opera ed. F. Wimmer, 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, 1745), 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 gogates or jet before mentioned among the bitumens; but that has no such quality as the author has here ascribed to this stone of Scaptesylæ. 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 Thracius 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 clef t (στυπτηρία σχιστὴ). 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," 5 says in regard to the stone called Carystius 6 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 ("undifflable"), from μιαίω ("to soil, defile").


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 (Textum Antiquorum, p. 359) remarks that the epithet ἱππάνδος may have referred to that variety of asbestos which is now called mountain-leather and commonly found with the fibrous asbestos.


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 Æthiopia 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 Literatur in der Alexandrinzeit, 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 Gerandrus 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 (\(\alpha l\nu o K\rho p\pi \alpha s\sigma i o u\)), the only kind of flax that is indestructible by fire.\(^5\) Plutarch (circa A.D. 46—120), in his *De oraculorum defectu*,

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1 This is a correct estimation of the process. The throwing into the fire of asbestina 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. 260) 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, § 228) says the same about the smell arising from burnt goat's horns or deer's antlers (\(m\rho r b o m \ i p s u m \ d e p r e h e n d i t\ \cap r p i n i\ \kappa o r n u s\ \nu e l\ \kappa e r v i n i\ \ u s t i\ \ n i d o r\)).

3 A city on the north coast of Cyprus.

4 A similar observation is referred by Pliny (XXVII, 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...\(\imath \m a g i n e m\ \lambda u n e\ \k a t i n e a\), redditique ea in dies singulos crescentis minusventiaque 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 \(\alpha m i a n t o s\) by \(\alpha l\-f\)alk (that is mica, not our tale).

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 tablecloths 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 live 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 Anaxilaus ⁵ 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.”

In another passage Pliny mentions amiantus as resembling alum (alumen) in appearance, and losing nothing from the agency of fire. It resists all practices of sorcery, particularly those of the Magi.

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. 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 peremptorily says that Pliny supposed asbestos to be a vegetable product. Bostock and Riley, pointing to the word mappa, as boldly assert that “he

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1 Inventum iam est etiam quo ignibus non absumeretur. Vivum id vocant, ardentissime in focis conviviorum ex eo vidimus mappas sodibus exultis splendescentes igni magis quam possent aqua. Regum iade funebres tunicae corporis savillam ab reliquo separant cinere. Nascitur in desertis adustisque sole Indiae, ubi non cadunt imbres, inter diras serpentes, adsumoque vivere ardendo, rarum invento, difficile textu propter brevitatam. Rufus de cetero colos splendescit igni. Cum inventum est, aequat pretia excellentiam margaritarum. Vocatur autem a Graecis ἀπόβλητων ex arguento naturae. Anaxilus auctor est linere eo circumdatum arborum surdis iactibus et qui non exaudiantur caedi. Ergo hic liso principatus in toto orbe (xxv, 4).

2 AULUS FALSIUS (Notices 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 igi dei perdit. Hic veneficis resitit omnibus, privatis Magorum (xxxvi, 31, § 189).


5 System of Mineralogy, p. 389.

6 Natural History of Pliny, Vol. III, p. 133.
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 LIPPMANN (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 selencitis 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 incombustible 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." A Syriac work on natural history of uncertain date, wrongly ascribed to Aristotle, in which Syriac translations of the Homilies of Basilius 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." 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 (assai putatur in Arabia [67, § 181]). In a similar manner croître was employed in French: R. de Berquin (Les merveilles des Indes orientales, p. 15, Paris, 1669), for instance, has, "Cette précieuse pierre croît en plusieurs endroits du monde."

1 A. Ausfeld, Der griechische Alexanderroman, p. 99.
2 K. Ahrens, 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 Yu 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 Sii-nga-n 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

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¹ J. YATES, Textual Antiquorum, pp. 359, 360.
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, T'oung 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-tse 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.

In like manner the text of the Chou shu, alluding to the same event as that of Lie-tse, is of a purely retrospective character, and devoid of chronological value. 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.

1 Ch. 5, T'ang wen.
2 Wilke (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 kuan-wu sword mentioned in Lie-tse is not, as hitherto believed, a sword, but a diamond-point.
4 The text of the Chou shu has passed into the Po wo chi (Ch. 2, p. 4 b, 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 Yu-shanodate 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, 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, 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.¹

¹ Notes on Chinese Literature, p. 193.
² He died in 159 (Giles, Biographical Dictionary, p. 478).
³ Compare Wylie, Asbestos, p. 148. This text is handed down under the name of...
A report of incontrovertible authenticity concerning asbestos-cloth being sent as tribute to China refers to the second month of the year 230, in the time of the Three Kingdoms, when envoys from an unnamed country of the Western Region (Si Yu), 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 郭洪 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-

¹ Sam 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. As regards the supposed animal origin of as-
bestos, 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'Ecole 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 Shahr-I-Sabz) they took ten dancers,
lion-skins, and hair of the rat which enters the fire (Ako shu mao). Chavannes cites the
definition given of this animal in the K'wen cáw, "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'amiante ou asbaste 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’ ἐνδίχεται μὴ κάσωσαι συντάσσεις τινὰς ζών, ἡ σαλαμάνδρα ποιεῖ φανερὸν ἀντι γὰρ, ὡς φασί, διὰ πυρὸς βαδίζουσα καταπεθάνουσι 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. 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." Also Theophrastus, in the same manner as his master, reproduced a popular opinion of his time, as seen by his addition "it is said" (φασὶ); but compared with Aelian and Pliny, he is rational and reasonable to a high degree.

Aelian ⁴ 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; 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 ἠ παύρα φαινομένη ἡν καλοῦσα σαλαμάνδραν, ἤτι δὲ καὶ ἱλειρὸς βάτραχος ἰπί δύον ἔδων οὔτε σημαίνει (De signis tempora, 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, 11, 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.” In the zoological 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.”

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 Ciliciarum montuosis salamandra ab ipsis devorata qui edere, moriuntur: neque enim est intellectus ullus in odore vel sapore; et aqua vitiumque interemt salamandra ibi immortua vel si omnino biberit unde potetur (xi, 53, § 116). In xxix, 23, be dilates still further on the subject.

2 Sicut salamandrace, animal lacerata figura, stellatum, numquam nisi magnis imbrisbus proveniens et serenitate desinens. Huic tantus rigor, ut ignem tactu restinquit non ali modo quam glacies. Eiusdem sanie, quae lactea ore vomitur, quacumque parte corporis humani contacta toti defluunt pili, idque, quod contactum est, colorum in vitiliginem mutat (xi, 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. Keller 3 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 sola animalium extinguat, si forent vera, iam esset experta Roma. Sextius... negatque restangui ignem ab ipsis.
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 αι, 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 samandar, samandar, samandar, semendel, semendel, samand, sandul, and Persian also salamandar, salamander, are derived from Greek salamandra, as admitted by all competent philologists (F. Hommel, Namen der Saugtiere bei den semitischen Völkern, p. 33; the Ethiopic Physiologus still offers the form salmandar; Selingam, Persian-English Dictionary, p. 642; Yule, in his Marco Polo, Vol. 1, p. 216). The derivation from Persian sūm, "fire", not "poison," which is samm, 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 Horapolou 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,

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\(^2\) 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 oft, 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.

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’HERBELOT nor YULE 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. 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: *Samandal البیش is a certain bird that eats al-bīš (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.*

2 *Julius Caesar Scaliger (De substitutio ad Carduam, 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-Baitar (1197—1248), who quotes Ibn-Semdjua as follows: “Some physicians report that the plant bīš بیش, grows in China toward the frontier of India, in a country called Halāhil, where alone it occurs. It is eaten as a vegetable in the country of Halāhil, 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 edible” (G. A. Stuart, *Chinese Materia Medica*, p. 11); neither does Bretschneider (*Bot. Sin.*, pt. 2, pp. 252—257) know anything about such a practice. The statement of the *Piem* regarding one variety of aconite, that it is of a sweettish 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. 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. rotenifolium*, are harmless and are eaten in Bhutan (Hooker, *Flora of British India*, Vol. I, p. 29). According to Flückiger and Hansbury (*Pharmacographia*, p. 15), the tubers of *Napellus* are taken in Kunawar as aphrodisiac. Arabic *biṣ* is derived from Hindi *biṣ*, the latter from Sanskrit *vishi* (visha, "poison"); *Aconitum ferox* (atishā, *Aconitum heterophyllum*, Hooker, *Bowr. Manuscript*, p. 186). The word appears in al-Birūnī (*Sachau, Alberuni's India*, Vol. II, p. 159) and in Qazwīnī, who describes how the fabulous poisonous girls of India are reared on it (Sivestre De Sacy, *Christomathie 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 Kenntniss 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* (Abb. Bayern. 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. Hecataeus, 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. 388) mentions two localities, — the Gokāl 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 [sānkhā]-palīa*, 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-Khallikan 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-Laţif, 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, Damiri mentions the salamander under the name samandar and samidar as "a certain animal well known to the people of India and China, according to Ibn-Sidah." 1

Damiri has compiled his information from the writings of his predecessors. The earliest Arabic notice of the samandal-phinix, as far as I know, occurs in the Adjaib al-Hind ("The Wonders of India"), written in the tenth century, where the bird is localized on one of the Islands of Wαqwaq: "It can enter fire without burning itself, and remain there long without eating anything but earth." 2 This work, however, while naming the phinix

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2 Litt 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 Mamun, 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 zoological 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 du 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 encore un reptile, tous lui attribuant d'ailleurs la faculté de vivre dans le feu sans se brûler. Marco Polo désigne par ce nom l'animale.2 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 Wāqīwāq spoken of by the Arabic writers should be identified with Madagascar (the other is Japan, Wā-tuk); 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 Wāqīwāq 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 Wāqīwāq being derived from the native names for Madagascar, Fakuaka, and for the tree sakwa). The authority of al-Berkawi, however, is not to be disparaged, according to whom Wāqīwāq 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). Wāqīwāq 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 Adjaiib should place the bird on Madagascar, in Indonesia, or in East Africa.


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 Gür (east
of Herat in Khovaresm). 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. 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.

The Salamander and Phoenix in Medieval 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. In the
contemporaneous lyrics of Italy we meet the allegories of the sal-
amander and phoenix 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 phoenix; or he
dies from the effect of the amorous fire like the phoenix, 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 phoenix, and life in fire
becomes his second nature, as is the case with the salamander.

1 F. Hommel, Namen der Säugtiere bei den sudsemitischen Völkern, p. 339; Jatarker,
Jamrist's Zoological Lexicon, Vol. II, pt. 1, p. 80. In another place Qazwini mentions also
the mineral asbestos (G. Jacob, Waren beim arabisch-nordischen Verkehr, p. 18).
2 L. Lewysohn, Zoologie des Talmud, p. 228.
4 The idea that the salamander is happiest in fire first occurs in Saint Augustine
(De cœnitate 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 span from its hair. The latter, for instance, occurs in Wolfram von Eschenbach’s Parsifal. The earliest mediaeval allusion to this pseudo-salamander asbestos seems to be made in a Provençal treatise on birds and animals ("Naturas d’alcus auzels e d’alcanas 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 phœnix, appears as a bird. Richard de Fourival, 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 mediaeval 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.

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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. 184 (Amstelodami, 1669).
5 Si via ignem perpetuum inextinguibilem facere. Accipe lapidem qui Abanton dicitur, et est coloris ferrei et quam plurimum in Arabia repertur. Si enim lapis ille accessurus nunquam poterit extinguui, eo quod habet naturam lanuginis, quae pluma salamandris vocatur, cum modo humidus uociusui pinguis, inseparabilia est ab ipso, et id solet ignem accurrum in eo.—Alberius' form abaston may be compared with the Middle-English forms asbestos, abeston, abiston, albeston.
6 Ed. of F. Pfeiffer, pp. 276—279.
F. Lauchert has shown that the mediæval notions of salamander and phœnix are traceable to the Greek Physiologus; but he omitted to point out that the conception of the salamander-asbestos is novel, and peculiar to mediæval times. Yule 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, 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 Europe 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 “saake salamander, which, when touching even the foot of a tree, poisons all its branches” (Lauchert, p. 194; Plint, xxix, 23).
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.

245
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 Zurusicar, 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 nothing 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."

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 rejected Polo’s designation of

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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 Yuan Dynasty.

2 Commurum et lapidum historia, p. 383 (Lugduni Batavorum, 1636).
Asbestos and Salamander.

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. Kircher 1 has fully discussed the subject from a scientific point of view; and his contemporary, the zoologist John Ray, 2 was able to state, “Quod Salamandra sineullo incommodo in igne vivere possit a vulgo creditum, verum a doctioribus dujum 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 Nūrabirvān 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 Fedā(1273—1331), and Yaqūt (1179—1229) point to Badakshan

1 La 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 Cordemay’s note in Yule’s Marco Polo, Vol. I, p. 216; and compare the above quotation from K. von Megenburg).

2 JOANNES RAIUS, Synopsis animalium quadrupedum, p. 273 (Londini, 1693).


5 The latter notice goes back to Dioscorides (L. Leclerc, Traité des simples, Vol. II, p. 414).

6 The Italian chevalier Aldini, about 1835, 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 fatila (that is, 'stone of the wick'), which resembles papyrus (bardī). The people believe that it is the plumage of a bird. It is styled also al-talq. It is not consumed by fire. It is placed in oil and kindled with fire, in which case it burns like a lamp-wick. 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-talq is traceable to Ibn al-Baitār (1197—1248), who groups around Dioscorides' notice of asbestos Arabic accounts of the mineral talq corresponding to our mica.

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:

"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

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1 That is, the phoenix. For explanation see above, pp. 318—323.
2 Compare the statement of Theophrastus (p. 302).
4 MacGuckin de Slany, Description de l'Afrique septentrionale par El-Bekrī, p. 386 (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 Derû is found a substance similar to it. This is a sort of stone, called, in the language of the Berber, *tamatghast*. 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. Abû Dulaf who wrote the diary of his journey to China about 941 tells of an incombustible tree, growing in the territory of the tribe Baja (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 turcs rel. à l'Extème-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 *Textinum Anti-quorum: 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 Ostiennis 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 lineti, 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. Abn Dulaâ 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 un consumable 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 asbestos wood.

Under the Sung dynasty asbestos 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, asbestos 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 asbestos 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 shen ts'ung ch'un 鐳園山叢談 (Ch. 5, p. 90; edition of Chi pu shen ch'ai ts'ung chu) of Ts'ai T'iao 蔡修, 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, Chueh Ju-lao, 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 mediaeval Europe and the Arabs; the third, inaugurated by the Yuan 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 mediaeval 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-tee. 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 mound 2 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

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1 My rendering is based on the text as quoted in the Wei-lie 緯畝 (Ch. 4, p. 3; ed. of Shou shan ku ts’ung shu, Vol. 74). This fundamental source on the subject has been overlooked by Wylie.

2 Su k’iu 蕪邱. 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."  

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。其一日海中肅邱有自生火。春起秋滅。洲上生木。木為火焚不糜但小 (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。以灰煮治以爲布薰不及華俱可火浣三也。又有白鼠毛長三寸居空木中。入火不灼。其毛可續爲布三也 (Wei Iio, 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 wu 烏錄 is credited with the statement that in Ji-nan (Tonking) is captured a fire-rat whose hair is made into cloth, being styled “fire-proof cloth.”1 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 Yu) 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'ó 郭璞 (276—324), a contemporary of Ko Hung, likewise alludes to the salamander-asbestos; for Kuo P'ó, 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 lio, Ch. 6, p. 3. 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 Poi-king 北景 in Ji-nan.
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'í-po 赤薄; and this is nothing but a variant for the well-known Shé-p'o 閤婆, 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'o" 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'o of the Tsin dynasty cannot have possessed any knowledge of Shé-p'o, 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'o, 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'o who took up this legend and placed its home on the Volcano Island first reported by K'ang T'ai: consequently Kuo P'o'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. 370; 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'o, further, shows his familiarity with the salamander in his edition of the dictionary Erh ya. This enumerates ten kinds of tortoise, the tenth of which is termed "fire tortoise" (huo kuei 火龜); and K'uo P'o annotates that it is like the "fire rodent" (huo shu). 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'o 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 Tse'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. Tse'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 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

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1 Ch. 1, p. 10 b.
2 This name has been adopted by the Polyglot Dictionary of K'ien-lung (Ch. 31, p. 24) with the literal renderings into Manchu tuwaï singgeri, Tibetan me byi, and Mongol gazi khulugama. The explanations given in the Manchu dictionaries show that the salamander-asbestos is understood (see Sacharov, Manchu-Russian Dictionary, p. 765).
3 Pei wen yün fu, Ch. 36, p. 59.
4 Entitled by him Shen i chuan 神異傳, otherwise Shen i king 神異經.
to Ta'uei Pao, is made to say, "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. 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'o. 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), "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 Ta'i tung ye yu by Chou Mi.

2 It must certainly be white, because asbestos coming out of a fire has this color. *Wylie* (P. 146), who translates from a modern edition of Shem 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*, Ch. 4, p. 3 b; and in the *Ko chi king yün*, Ch. 27, p. 13. *Wylie* (P. 146) 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 (tuan) of fire-proof cloth. Duke Kie, recognizing it from afar, exclaimed, 'This is fire-proof cloth, indeed: Two pieces are made from twisted bark, 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. 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 ted trees 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."

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

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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 tuan of fire-proof cloth." (杰公至市見商人賣火浣

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 Cadomia tribola, Hance. Wylie takes this for 彫, 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.

6 南海商人賣火浣布三種, 杰公遙識日, 此火浣布也。二是緝木皮所作。二是続鼠皮所作。以詣商人具如杰公之說。因間木鼠之異公曰。木堅毛柔是可別也。以陽燧火山陰拓木蒸之木皮改。常試之果驗 (Ko chi king yün, 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, 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 medieval 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

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1 This is confirmed by another passage in the same work Liang se kung te k’i, 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’u shu tai ch’eng, Pien i tien 41, Woman Kingdom (女國), Kui k’ao, p. 2. It is said to have been translated in its entirety by D’Hervey-St.-Denys in his Mémoire sur le Fén-nang, 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, 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, has left a small collection of "Wonderful Stories," among which is the following: "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

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1 See above, p. 308.
are also mentioned worms found in long-lying snow. 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. 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. In this manner we gain a satisfactory clue 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, 86, § 119), who speaks of the same creature after Aristotle, calls it pyraulis or pyrolocom (others read pyruwota), and describes it as a winged quadruped (pisnutum quadrupes) of the size of a larger fly. AELIAN (Hist. anim., ii, 2) styles it pyrigonos ("fire-born").

2 Pliny, in harmony with Aristotle, places it only on Cyprus (in Cypri aerarvis for- nacibus), while Aelian gives no locality.

3 It is possible also that the μυδια of the Greek text (from μυία, "fly") led to a confusion with μυς ("mouse"), and gave rise to the conception of the salamander as a rat (Qazwini), 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 猟猥. 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 onomatopoeia from the creature's reiterated utterance. Marcel Devic says the word is adopted from Malay gekok [gêkoq]. This we do not find in Crawfurd, who has tâké, tâkèk, and gôké, 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 yün, 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-Johnson, p. 307.

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 Gonioccephalus 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 ts'ao 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"). On the other hand, the Chinese know a saurian, ko-kiu 亀蛇, being a word-formation analogous to the Malayan names of the lizard, and, according to Chinese authors, imitative of the call of the animal.

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, 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-jo, an imitation of its call-note, which is frequently repeated" (O. BECAERT, Wanderings in the Great Forests of Borneo, p. 35). In the Encyclopaedia van Nederlandsch-Indië (Vol. IV, p. 400) the word is given as loke, which is peculiar to Sundanese; it passed also into the language of the Batak on Sumatra; in Malay it is tekak and tekok; in Javanese, tekak. Compare Moro tagatak or takatak, "lizard" (R. S. PORTER, Primer of the Moro Dialect, p. 45). In the same encyclopaedia (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 Pei ts'ao kung mu, Ch. 51 a, p. 20 b; and Wu li chiao shi, Ch. 10, p. 12.

2 Pei ts'ao kung mu, Ch. 48, p. 6. The oldest text referring to it is the Long ping lu i of the T'ang (compare PRIEMAIER, Denkwürdigkeiten aus dem Tierreich Chinas, SBAk. Wien, Vol. 60, 1875, p. 14).

3 The Malay Archipelago, p. 331.
viewpoint, by the absence in China of any specific reference to the phœnix, 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 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.\(^1\)

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\(^1\) **Wylie, Notes,** p. 192. The passage is in Ch. 18, 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 tea piem 杜陽雜編, written by Su Ngo 蘇鵲 in the latter part of the ninth century, contains the following story (Ch. 9, p. 1; edition of Pai Shu): "During the year of the reiga of the Emperor Shun-tsung 顺宗 (A.D. 806) the country Kiù-mi 柯弭 [otherwise 柯彌], the territory of Keria; see CHAVANNES, *Documents sur les Tou-kiue 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." Abû Ubaïd al Bekrî (1040—94) of Cordova (MAC GUCKIN DE SLANE, *Description de l'Afrique septentrionale par El-Bekrî,* p. 43) has the following account: "Nous donnons le récit suivant sur l'autorité d'Abou-'l-Pâdi Djâpher ibn Yousof, Arabo de la tribu de Kelb, qui avait rempli les fonctions de secrétaire auprès de Mounis, seigneur de l'Iṣ̄fīyīka: 'Nous aissasions à un repas donné par Ibn-Ouanemmou le Sanhadjien, seigneur de la ville de Cabes, 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 connaissait 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-faisal allumé, et voilà que l'oiseau se dirigea vers ce meuble et têcha d'y monter. Les domestiques coururent 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 ardant, et se mit à bécquer 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'u 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-érh-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.  

**Theory of the Vegetable Origin of Asbestos.—** In order to arrive at a correct appreciation of the complex notions developed by Ko Hung and Kuo P'o 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

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1 T'ao shu tai ch'ing, xix, chapter "Strange Animals," hui k'ao 8, p. 9.
of that country. In the article on Fu-nan, inserted in the Annals of the Liang Dynasty (502—556), 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 大漟 (‘Great Expanse’). 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 马五洲. Going again over a thousand li in an easterly direction across the Ta-chang Ocean, one reaches Volcano Island. On this island there

2 Liang shu, Ch. 54, p. 3; likewise in Nau 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 The 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 rendering in the Lu’ei tiao (Ch. 4, p. 3) of the Sung period, in an essay entitled “Asbestos.” Wylle 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 火覽 (Ko chi kung yuan, Ch. 27, p. 13) writes 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 claim to 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 Bandu, 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 kerciifs, which do not differ in appearance from textiles made of palm and hemp fibres, 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-lust 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 annulatus), supposed to be peculiar to the island” (ibid., p. 160).

1 Tsiao ma. Peiliot renders this by “scarched hemp” (du chanvre rousu), as it the reading were 焦麻. 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 Chi pu 赤雅 by Kuang Lu, Ch. A., p. 5, ed. of Chi pu ten chai ts'ung shu). The so-called Manila hemp of commerce is obtained from the Abaca (Musa textils), the staple material for Filipino weavings (see C. R. Donor, 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. 442-450). Marco Polo (ed. of Yule and Cordier, Vol. II, p. 124) mentions that the people of the province of Kuni-chou manufacture stuffs of the bark of certain trees which form very fine summer clothing. I do not believe with Yule (p. 137) 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 province of Li-p'ing, province of Kuni-chou, indeed make textiles from tree-bark, called bark-cloth (p'i pu 皮布; see Ta Ts'in i t'ung chi, Ch. 400, p. 4). According to Megasthenes (Strabo, xv, 60) the Sarmanes (Sanskrit śramaṇa, “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 Jule, 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.

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; 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 steenflax, that is, "stone flax;" German Flachsstein).  

2 This method is practised not only by the Malayopolynesian 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. Mariaden (History of Sumatra, p. 49, London, 1811) says on this subject, "The original clothing of the Samurans 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 P. Sarasin, Reisen auf Celebes, Vol. I, p. 259, where the process is described). See also Dodge, I. 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 蘇物, 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. 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 T'ai, Fu-nan, and Kiao-chi (Tonking). 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; and this same event is alluded to in the Annals of the Tsin Dynasty, in the life of Fu Kieu 樂毅 (337—384), in the statement that India offered fire-proof cloth. We remember that Pliny naturalizes asbestos in India, that Hierocles equips the Indian Brahmans with

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2 T'ang shu, Ch. 221 A, p. 10.
3 Shi leu kuo ch'un ta'in, Ch. 37, p. 11 (compare Wylie, l. c., p. 143).
5 Tsin shu, Ch. 113 (compare Pien teo lei pien, Ch. 21, p. 6).
asbestos garments, and that the Arabs derived the mineral from Badakhsan (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-nan 1 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 Hsuan lan or Yuan lan 玄 (玄) 览, a work of the T'ang period (618—906), 2 says, "In Pi-k'ien 貳騫 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 "Pi-k'ien"

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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 Palliot, seems to have been along the Irrawaddy and the Indian Ocean. The information of the Huan lan, of course, is deficient, as in the Liang Annals Volcano Island has nothing to do with Pi-ki'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 She-p'o, by which Java became known from the first half of the fifth century. This conclusion is confirmed by a text ascribed to the Iwu chi and contained in the T'ai ping yu lan, in which the Island of Blazing Fire is located in the kingdom of Se-tiao, which is doubtless a misprint for Ye-tiao.

Now, we owe to the ingenuity of Palliot the identification of this name with the old Sanskrit designation Yavadvipa, and this solution of the problem seems to me a well-assured result. Since the Iwu 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 Iwu 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

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2 Ch. 820, p. 9 (edition of Juan Yuan, 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. 447.
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 立中記, 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 kien 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

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1 Compare Wylie, I. c., p. 146.
2 His personal name is unknown.
3 In agreement with Pao-p'u-tse (p. 332).
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. 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 sing 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) 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 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. 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.

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1 This observation, of course, relates in reality to asbestos.
4 T‘u shu ts‘ai ch‘eng, chapter on fire (teu le), p. 11 b. Kū-se is perhaps identical with Kū-shī 車師, designating "Turfan-Daima."
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. In the following section I shall try to explain how this theory originated in Fu-nan.

The Arabs and mediæval Europe, as already observed, were too much absorbed by the identification of asbestos with the salamander and phoenix to pay much attention to the idea of vegetal prove-nience. 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 (xylotis),—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 (YATAS, Testirum Antiquorum, p. 182). VIRGIL (Georgica, 11, 121) has the verse, "And Seres comb their fleece from silken leaves" (Velleraque ut folis dejectant tenuia Seres). STRATO (xv, 20) supposed the raw silk material to be a sort of byssus fibres scraped from the bark of trees. According to DIONYSIUS PANILOMENUS, 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). PLONY (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 Wylie, 1. e., 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 Breitschneider (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 Ebn Hankal, 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. 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 Ti'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.

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 Khordādeb, 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 861, 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 Etua, 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-

1 Viret eterno hunc fontem igneum contegens fraxinus (11, 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'o, 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 shén ki¹ this compromise seemed too radical, and he arbitrated by restoring K'ang T'ai and bringing Kuo P'o 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 WELX, i. 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.” Wylie refers this account to the tribe called Jan-mang (弁驃), 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, a tribe settled in Sze-ch‘uan Province (north-east of Mao chou). 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 with the significance of clothing woven from the down of birds or the fine undergrowth of hair of mammals. Such textiles woven from bird’s down are ascribed by the Chinese also to the aboriginal tribes inhabiting southern China. E. H. Parker 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 Tam (compare Hantu, China and the Roman Orient, p. 36). The tribal name Mang is doubtless identical with the Mang studied by G. Devéria (Frontière sino-annamite, p. 159); see also Chavannes, T‘oung Pao, 1906, p. 889.
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, T‘oung Pao, 1905, p. 528).
6 Lecor, 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 Couveur has the wrong rendering, “vêtement de laine.”
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*, 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, the foundation of the fabric being of silk, into which the feathers were ingeniously and skillfully 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 in Kuang-si made a special industry of fabricating a tissue of cotton and goose-down. Kuang Lu, who spent several years among the Miao tribes in the service of one of the female chiefs, 1

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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 *tien noo jung* 天鵝絨 ("silk-floss of the wild swan"). I find this term mentioned in the *Tien lung k'ai sou* (Ch. 2, p. 46) as the name of a fur garment woven from down and feathers of hawks and wild geese.

3 G. Deléria, *Frontière sino-ammamite*, p. 112.

and wrote an interesting account of them in his book *Ch'i yu* 赤雅, mentions the bird-feather textiles under the name *niao chang* 鳥章 and discriminates between fine feather weavings styled *so-fu* 鎮褐 and coarse feather textiles termed "goose fishing-net" (*ngo ki* 鵝อำนวยความสะดวก).

This evidence permits us to infer that the term *huo ts'ui*, as applied to asbestos coming from the South-western Barbarians, 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 parrots 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 Shêu 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 Yuan Dynasty term 'stone silk-floss' (*shi jung* 石絨)." An asbestos-producing locality in

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1 The preface is dated 1635. The passage is in Ch. a, p. 6 b of the reprint, in *Chi pu tsu chai ts'ung shu*.
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 *Ta'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. 195, p. 9 b; *T'oung Pao*, 1904, p. 40).
5 *Kuo chi kung yuau*, Ch. 27, p. 13 (compare *Wylie*, l. c., p. 153). Regarding the asbestos of the Yuan see below.
Sze-chʻuan is here clearly pointed out; and this agrees with the statement of F. P. Smyth¹ that asbestos is met with in Mao chou, Sze-chʻuan; 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. Pallas² 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. Crantz⁵ has the

³ In Russian Sholoknaya 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 1880, 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 Strahlenberg, Nord- und östliche Teil von Europa und Asia, p. 311, Stockholm, 1730).
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, crystal-line, 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

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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.  

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), who, in a memorial to the Emperor Kubilai, stated that “Mount Pu-ko-tsi 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 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 Shen (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.  

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1. *The woj shan t'ung ch'an* (already quoted above, Ch. 5, p. 20 b).
3. *Yuan 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 (Geeks, Products, p. 450). Also Chang Ning, one of the Ming, author of the *Fong chou ts'ing yu* 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 ti* (P'ei sua yun 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 Pelliot, *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-taci, Wylie, who has already called attention to this passage, 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 writes the name of the mountain 别怯赤山, translating this by "red mountains of Pie-kieh," which he places in Sze-ch'uan at 27° 12' latitude and 102° 53' longitude.

A. Williamson 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 lien, 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 裘東, and are as fine as silk flax. They are extracted from the stone, and reeled like hemp 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 Yuan, and possibly during the sixth century. The following text from the Persian geography of Ahmed Rûzi 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. Huany (Pub. de l'Ecole 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.
3 This is the reading of the Fang chou tea yen.
4 It would be interesting to settle this question. Thus far, I have failed to find any indications in the Yuan shi regarding the site of this mountain.
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, who furnished the name *pu lu ce mu* (literally, "wood without ashes;" incombustible wood), and pointed out three localities where it is obtained,—Lu-ning fu in Shan-si, district of Yii-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, who stated that "asbestos is common in Shan-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, 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

3. In the American Museum, New York (Cat. Nos. 12427, 12652—12856). 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.

Geerts 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-chên on the subject of pu huei mu, we are struck by the fact that he does not make any allusion

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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 Chefu 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 *Pên ts'ao kung mu*, Ch 9, p. 16 b. The translation given by F. de Mély (*Lapidaires chinois*, p. 85) is an incomplete abstract from the *Pên 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 huei mu refers to the mineral, and huo huan pu to the finished textile product.

There is another term, yang k'i shi 起石, which likewise refers to a variety of asbestos. It is difficult to see why Smith and Geerts 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. Handsbury identified yang k'i shi with “asbestos tremolite, silicate of lime and magnesia;” and this is what we still include under “asbestos.” It appears that this stone is used only medicinally. The English and Chinese Standard Dictionary lists both pu huei mu and yang k'i shi under “asbestos.”

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1 L. c., p. 27.
2 L. c., p. 448.
4 This word is derived from Tremola, Mount St. Gotthard, where this variety was first found.
5 F. de Mély, Lapidaires chinois, p. 106; Brot in Basin, Chine moderne, p. 556.
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 Piie 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 Ta'i and in Lang-ye, adding that it is the root of mica (yünn mwu, “cloud mother”) in the Cloud Mountains (Yün shên). Tao 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 Yè-chou together with alum (f'au 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 Huang-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 Tsiao 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 Ts’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 Tsiao 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 dominibus palatii nostri studiose operatur, et inde habemus vestes et pannos ad omnes 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 incombusible 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 medieval 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 pistoribus panis efficitur et in elibano facto...
ex asbesto ponitur et coquitur. Pavimentum clivani est de topazio viridi, qu. naturaliter est frigidus, ut caliditas asbesti temperetur. Alioquin panis non coqueretur sed conhureretur. Tantus est calor asbesti). The walls of a furnace in the bakery (pistrinum) were likewise of asbestos (Est enim furnus factus exteriue de lapidibus preciosis et atro, interius caelum et parietes sunt de albedo lapide, cuius natura talis est, quod, semel calefactus sit, deinde in-remissibiliter 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 extingo, "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 wove, which is cleaned by putting it into the fire instead of washing it." In fact, the text, as reprinted in T'u shu ts'ai ch'êng, 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蜥蜴鬚蛇以避熱毒洲中有火木其皮可以為布炎丘有火鼠其毛可以為褥皆焚之不灼污以火浣). 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 sis is not known to me; according to K'ang-hi it is identical with 蝾属. 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 Yü 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 Yü 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 摩厨 (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 乙癸辛雑識 (續集 1, p. 38, éd. du Pai hai) et Çi ya t'an tsa 釵志雅堂雜鈔 (chap. 1, p. 40 b—41 a, éd. du Yüe ya t'an ts'un shu). 1

Le texte du Kwei sin tsa 乙癸辛雑識 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。其取名之日押不蘆。生土中數丈。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瘡而死。雖加以刀斧亦不知也。至三日後別以少藥按之即活。蓋古華陀能剖腸澆胃以治疾者必用此藥也。今聞御藥院中亦儲之。白延玉聞之盧松崖。成云。今之貪官污吏賊過盈溢被人所訟則服百日丹者莫非用此。

Voici le texte du Či ya t'an tsa ĉ'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．
或從傷其皮則爛．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．其皮條之前則繫於犬之足既
而用杖打犬．犬奔逸則此物拔起．大 [pour 犬]
處此氣即斃．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
即通身麻痹而死．雖刀斧加之不知也．然三
日別以少藥投之即活．蓋古者華陀能刳腸
湔臓治疾者或用此藥也．聞今御藥院中有
二枚此神藥也．白延玉問之盧松圭云．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 Kweı sin tsa ść (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 ĉ'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 croît
dans la terre jusqu'à une profondeur de plusieurs toises. Si un
homme se heurte contre la plante par erreur, il recevra son ex-
halaison 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’expulsion 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 maladies.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-yú qui l’a appris de Lu Sun-yai.


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 Çou Mi soit resté le seul auteur chinois à parler de la plante ya-pu-lu. Du moins, Li Şi-ćen, dans son Pen ts’ao kań mu (chap. 17 r, p. 13 b), ne cite-t-il que le texte du Kweï sin tsa ści 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: 貪官吏史罪甚者則服百日丹 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 Dabrý de Thiersant 3 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 ċi kīn yüan 格致鏡原 (chap. 69, p. 6 b) a fait du texte du Kweï sin tsa ści. Ici la plante est introduite sous le titre "herbe qui réveille de la

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1 Cette addition est donnée aussi par le Yüan hien lei hian (chap. 411, p. 22) dans un autre texte, de seconde main et mal digéré, concernant le ya-pu-lu. Le Pei mien lei kwań t’an fan p’i (chap. 97, p. 26 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. 38. 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. Naturellement Cou ne vent 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 : 一名押不慮. 出回回國以少許麻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, 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.

La plante décrite par Cou Mi peut être identifiée sans difficulté avec la mandragore sur la base de la transcription ya-pu-li, laquelle correspond exactement à l'arabe-persan abruh أو يبرع, désignation pour le fruit de cette plante. Elle-même s'appelle en
arabe toffah-el-jenn ("la pomme des esprits") ou siraj el-kotrob ("la lampe des lutins"), aussi la'ba 'umd et be'il el-jinn ("œufs des esprits"). 1 En Araméen le fruit est nommé yawruha العربية et la forme jerabah جرابة 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 ḥerpuouµ laquelle, selon moi, semble être apparentée à l'arabe abruh: peut-être ce mot est-il à corriger en ḥerpuouµ. La mandragore (ou mandegloire par étymologie populaire) 8 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. 8 Les propriétés narcotiques de cette


8 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 mandagores, par une altération du mot mandragora. 'Aujourd'hui, ajoute l'auteur du Journal du roy Charles VII, le vulgaire les appelle mandagoliers, que maintes sottes gens gardoient en lieu de repos, et avoient si grande foi en celle ordure, qu'ils croyoient fermelement que tant comme ils l'avoient (mais qu'il sut bien nettement en beaux drapes de soye ou de lin enveloppe), jamais jour de leur vie ne seroient pauvres. 7 Dans le dialogue de Mathurine et du jeune du Perron, celui-ci lui dit: 'As-tu point aidé a souffler le feu lent sous la coque d'œuf où est le germe, la soye cramoisie, et cela de quoy les magiciens faisoient leur pâque avec la petite mandragore?' (Confession catholique du sieur de Sancy, liv. II, ch. 1er)." Aussi l'expression main de gorre était en usage populaire.

8 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 plait 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, noircrâtre extérieurement, blanche à l'intérieur, charnue; ses feuilles sont grandes, les plus extérieures obtuses, les plus intérieures aiguës; leur couleur est un vert bleuté, luissant en dessus, terre en dessous. Le pétirole est long; les hampes florales sont longues, rougeâtres, et un peu pentagonales.
La Mandragore.

La 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 mardum-
gīyāḥ, comme supposent Wetzstein 1 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 lancéolées, 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). 4

1 L. c.
2 Reallexikon, p. 36. Une nouvelle hypothèse sur l'affinité du nom grec se trouve à la conclusion de cet article.

de critique reste à faire. Les notes suivantes ne doivent être regardées que comme un commentaire du texte de Cou 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 μαναθράγαυον des Septante, mandragora de la Vulgate, et γιάπβιδι du Targum d'Onkelos et du syriaque, en outre, la plante est répandue en Palestine. — Le savant japonais Kumagusa Minakata (Nature, L, 1895, p. 608; et LIV, 1896, p. 343—344; cf. Young 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 vais pas entrer dans une critique détaillée de ce travail, mais je voudrais remarquer seulement que ses rapprochements entre la mandragore et la plante hsi-su 商陸 (Phyllolca acinoae) ne sont que des parallèles psychologiques, mais non historiques (voir infra). Minakata a aussi donné une traduction du conte de Cou Mi avec quelques contre-sens sans consulter le texte meilleur du Kwei sin tua li, et a fait allusion à Joséphe 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 Macchiaveli (1469—1527) est l'auteur d'une comédie, d'abord intitulée Comedia di Callimaco et di Lucrezia (1re édition, 1534; etc.; éd. sous mes yeux, Roma, 1888), 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 us a cosa più certa a ingavridare d'une potion fatta di Mandragola, questa à una cosa esperimentata da me due para di volte, et trovata sempre vera: e se non era questo, la Reina di Francia sarebbe sterile, e infinito 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 Mandragora, nouvelle tirée de Machiavel" (Œuvres de J. de la Fontaine par H. Regnier, tome V, 1889, p. 23, avec une introduction intéressante de l'éditeur).

"Cette recette est une médecine
Faite du jus de certaine racine,
Ayant pour nom mandragore; et ce jus
Fris par la femme opère beaucoup plus
Que ne fit onc nulle ombre monacale
D'aucun couvent de jeunes frères pleins."

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 facettiosa et dilettevole, en quatre actes et un prologue, imitation de la Mandragola, écrite dans les dialectes vénitiens, bergamasque, italor-grec, etc, (Venise, 1552, réimprimée en 1660, 1661, 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 Fouqué, a para 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 ouvrage De bello judaico (VII, 6, § 3), écrit entre les années 75 et 79, s'exprime ainsi: "Or dans ce palais croissait une espèce de rue 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'Hérodé, 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'éluerer, 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

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1 Flavii Josephi opera graece et latine ed. G. Dindorfius, II, p. 316 (Parissia, 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 chasserait 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.  

La cité de Baaras étant située en Syrie, sur le bord oriental de la mer Morte. Josephhe 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.  

Un conte semblable est raconté par Élien (Hist. an. XIV, 27) qui nomme la plante cynosperatus (κυνόσπερτος, "deraciné par un chien")

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1 Exempta d'ê'en tois basileiois kai τύχαιον αξίου τοις μεγίστοις θαυμάσαι εναίξι γάρ ούδεμις ύψους kai πάχους ἀπέλειπτο. Λόγος d'êν ἀπὸ τῶν ἱππόδου χρώνων αὐτῷ διαμένεται, κῶν ἐπὶ πλείστον ἵππως οὐμένης ἐξεκοπή όπλοτο τῶν παραλαβόντων τὸν τόπον ουδαίων. Τῆς φάραγγος δὲ τῆς κατὰ τῶν ἴμπων περιεχούσης τὴν πάλην Βαάρας ὀνομάζεται τὶς τόπος, φύει τῷ ῥίζαν ὁμοιώμασι λεγομένον αὐτῷ. Αἱ Φλογί νῦν τῶν τριών άνακριντο, περὶ δὲ τὰς ἐπίγειας σέλας ἀπαραπτότα τοῖς ἵπποις καὶ βουλαρμένοις λαβὼν αὐτὴν ὕστερ εὐχερίμωτος, ἀλλὰ ὑποφύγει, καὶ οὗ πρότερον ἱσταται πρὶν ἢν τις ὕμνον γυναικὶς ἢ τὸ ἴμμανον αἷμα χειρί αὐτῆς οὐ μὴν ἄλλα καὶ τὸτε τοῖς ἴμμάνοις προθάλατο ἱστατε, εἰ μὴ τόχῳ τις αὐτῶν ἴμμανον ἑπενεγκάμενον τῷ ῥίζαν ἐκ τῆς χερσῶν ἀντιμεμεν. Ἀλλακτεί δὲ καὶ καθ' ἕτερον ἰερόν ἀνυδόνως, ὡς ἐστὶ ποτε. Κάθιμ πάνω αὐτῶν περιορύσσουσιν, ὡς ἐναὶ τὸ κρυσταλλόν τῶν ῥίζας βραχύτατον, λέγει αὐτὴν ἀποδοῦσιν κῦνα, κακεῖνον τῷ ὁπολοῦθειν ὁμήρους, ἢ μὴν ἀναστᾶτε ἔκδοσι, δύσκει δ' εὖ ὁ κόμων, ὡσπερ ἀντιδεότα τοῦ μέλλοντος τῶν βοτάνων ἀναρώσεται. Φόβος γάρ οὐδεὶς τοῖς μετὰ ταῦτα λαμβανόντοι. Ἐσταὶ δὲ μετὰ τούτων κυδώνων διὰ μίαν ἱμέραν περιποίησατος τὰ γάρ καλοῦμενα δαιμόνια (ταῦτα δὲ ποιητῶν ἵπταν αὐθέρων πνεύματα) τοῖς ξώνιν εἰσούσαι καὶ κτίσει τοὺς θυσίας μὲν τυγχάνοντας, αὕτη ταχέως ἐξελάτων, καὶ προσενεχθή μόνοι τοῖς νοσοῦσιν.  

3 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 belladonna ou même 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.
LA MANDRAGORE.

ou aglaophotis (ἄγλαφωτις, 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 luzantine comme une étoile, car elle rayonne et ressemble à du feu (Φλωγώδης γάρ ἔστι καὶ ἑορτή τυπό = 燈 ou 矢). 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 Égypte sous le nom d'osirite, 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. C'est la même superstition que nous avons trouvé dans Josèphe et Élien, et ici même l'Orient (l'Égypte 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.

La légende occidentale reproduite par Cou Mi présuppose évidemment une version d'origine islamique qui doit s'être répandue en Chine à l'époque des Song. En consultant la vaste compilation d'Ibn al-Baitar dans l'excellente traduction de L. Leclerc, nous n'en trouvons pas de trace. Malheureusement, Leclerc a cru bon d'éluder 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-Baitar, 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, Ibn al-Baitar 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 Quae clericus, quae sunt montiti veteres Magi, cum adolescentibus nobis visus Apion grammaticae artis prodiderit cynocephalian herbam, quae in Aegypto vocaretur osirite, divinam et contra omnia venefica, sed si tota eraretur, statim cum, qui eruiisset, 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 mandragoras mala ustavere, formicas lambunt); cf. Solinus (XXVI, 8): Cum gustavere mandragoras mala, moririntur: sed eunt obviam, ne malum in perniciem convalescat et formicas vorar ad superadam sanitatem.

3 Traité des simples, II, p. 246—248.

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'Herbelot 2 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 Élién, 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 Qazwini à ce sujet, comme l'a reconnu aussi G. Jacob, 3 n'est que l'écho des traditions hellénistiques. Qazwini 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 Élién. 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, 11, p. 247.
2 Bibliothèque orientale, 1, p. 73.
3 Studien in arabischen Geographen, p. 165.
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 Cou 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 ἀνθρωπόμορφος 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-Baitâr 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'avoisinent 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.
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.\(^1\) Théophraste\(^2\) dit qu’elle induit en sommeil, mais que donnée en plus grande quantité, elle est mortelle (ou δ’υνωτικών πλείους δι διδόμενοι και θανατηφόροι καθάτερ δ 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-Baitar, 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 Cou Mi et Dioscoride, dans lequel on a fait infuser des racines de mandragores s’appelait mandragorite (Littré). En italien c’est mandragolato. L’usage de ce terme remonte jusqu’à Dioscoride (V, 81: δ μανδραγορίτης οἶνος). Théophraste\(^4\) a déjà fait observer que la racine est administrée dans du vin ou du vinaigre (διδόκατι δ’ἐν οἶνῳ ὑ δεῖ). 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 etymologicarum libri XX (XVII, 9): "Mandragora dicta, quod habeat mala suaveolentia in

\(^1\) Via somnifica pro viribus bibentium; media potio cyathi unius. Bibitur et contra serpentes et ante sectiones functionaem, ne sentientur; ob haec satis est aliquis somnum odore quaesuisse (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 simulatem. "Ἀνθρωπός enim graece, latine dicitur homo. Cuius cortex vino mixtus ad bibendum datur iis quorum corpus propter curam secandum est, ut soporati dolorem non sentiant. Huius species duas: foemina, foliis lactueae similibus, mala generans in similitudinem prunorum; masculus vero folia bietae 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 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. ²

Nous lisons dans la matière médicale d'Ibn-al-Baitar (1197—1248) sur la plante Λυφ (Arum dracunculus): "Il y en a trois espèces. L'une s'appelle en grec dracontion, ce qui veut dire arum serpentina, à cause que sa tige tachetée ressemble à une peau de serpent. C'est l'arum long, le grand arum, gargantia. D'autres l'appellent arrakha, parce qu'ils prétendent qu'elle jette un cri, arrakha, 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.


³ D. Chwolson, Seabier, II, p. 458.
le jour de la Pentecôte, et, de plus, que celui qui l'entend mourra dans l'année."

La même observation est aussi faite par Ibn el-
'Awwām de Séville, qui écrivit dans la première moitié du VIe siècle de l'hégire le Kitāb el-falāḥa (Livre de l'agriculture).

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. ¹

¹ L. Leclerc, Traité des simples, III, p. 248.
³ Dans plusieurs autres passages, Shakespeare fait allusion à la mandragore.

Not Poppy, nor Mandragora,
Nor all the drowsy Syrrups of the world
Shall ever medicine thee to that sweet sleep
Which thou owest 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 mandragorae” au sens de ginseng, et le dictionnaire persan-anglais de Steingass donne cette définition de l’expression mardum-giya: “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 saurais 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 quelque 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 juge 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 (1. 3, 86)

Or have we eaten of the insane root
That takes the reason prisoner?

permet contenter 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 XVIIe 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 3e 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, 3095—6. — L’observation du P. Martini fut relevée par J. P. Lafaute (Mémoire présenté à son altesse royale Monseigneur le Duc d’Orleans, 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 pouvait être une espèce de mandragore. J’eus le plaisir de voir que je m’étois rencontré sur cela avec le Pere Martini, qui dans l’endroit que j’ai cité, et qui est rapporté par le Pere Kirker [sic], parlé en ces termes. Je ne saurais 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.” Lafaute 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 Lafaute 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 Lafaute c’est qu’il rapproche le nom iroquois du ginseng canadien, garent oyen (qu’on dit signifier “cuisines, jambes” + “deux choses séparées”) au mot chinois traduit par lui “ressemblance de l’homme”. Il en conclut que “la même signification n’avait pt être appliquée au mot Chinois et au mot Iroquois sans une communication d’idées, et par consequent de personnes. Par là je fus confirmé dans l’opinion que j’avais déjà, et qui est fondée sur d’autres préjugés que l’Amérique ne faisait 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 Béretchnieker (“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 Shan-taï \(^1\) 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 Pei wen cài kwaï k'ün faï p'u \(^3\) il y a encore un texte plus ancien à relever ce trait, le I yüan 異苑, attribué à Liu King-šu 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 Kiⁿ-šu dit: "Anciennement il y eut un homme qui, en fouillant le sol, y introduisit sa béche. Puis il entendit dans la terre des soupirs, et en recherchant le son, obtint de fait un ginseng."\(^4\) Rappelons aussi le fait que les Chinois se servent de ginseng comme aphrodisiaque.

Ces coincidences 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 parait comme un développement logique.

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\(^1\) La partie du Shan-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 ju, chap. 32, p. 1. Le Pen ts'ao k'ai mén (chap. 19 A, p. 4 b) tire le même texte du Kwaï t'ou hìn ăi 廣五行記.

\(^3\) 昔有人掘之始下鏽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 fa-
culté 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 Cou Mi que des racines de mandragore
éttaient importées en Chine aux temps des Song et effectivement em-
ployées n'est pas moins intéressant. Cependant il est frappant que ni
Cou K'ü-fei ni Cao Zu-kwa ne paraissent connaître ce commerce. 2

Mais Cou K'ü-fei 周去非 nous a laissé une anecdote sur une
autre plante apparentée à la mandragore quant à la composition et
t 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, Phytolaccæ acinosa, là à 行陸 (cf. Bretschneider,
Chinese Recorder, III, 1871, p. 219; Bot. sin., II, no. 112, III, no. 131), décrite par le
Fia lu avec les mêmes expressions que le ginseng ( 如人形有神) et ap-
pelée aussi ye 肝 夜呼 ("criant de nuit"). Mais le Pen ts'ao hàn 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 tāo tāu 五雑俎.

2 La plante lan-tu 狍毒 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 de-
scription 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 Hemsley (Journal
Linnean Society, XXVI, p. 175) en regissent une Mandragora caulescens au Yunn-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 Lii wai tai ta 嵩外代答, écrit en 1178, l'auteur chinois
rapporte ainsi: "La fleur man-t'o-lo de la province de Kwang-si
croit partout dans l'état sauvage. Ses feuilles sont larges, les fleurs
blanches, et la formation des fruits est comme chez l'aubergine ou
la miélongèze (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 séchent 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 tor-
peur, 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."

Le nom man-t'o-lo 曼陀羅 est contenu dans le Fan yi min 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 Śi-chen
croit aussi au nord de la Chine, soit appelée d'un terme sanskrit.
Elle n'apparaît pas dans les documents avant l'époque des Song. 

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 广西曼陀罗花遍生原野大叶白花结实如茄子而遍生小刺乃药人草也。盗贼採乾
而末之以置人饮食使之。醉则攀摘而赶。南人或用为小儿食药去积甚善。— Lii wai tai ta, chap.
8, p. 16 b; éd. du Či pu tsu tài ts'un juu.

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 hsü i sün
(section botanique, chap. 124), sous le titre man-t'o-lo, ne fait que citer la notice du Pen
tao hao tzu su, puis une brève remarque de Č'en Yü-i 陈与义 des Song, un conte
tiré du T'ai Yüan 談苑 par Yań I 楊億, qui vécut au commencement de l'on-
zième siècle et collabora au T's'e fu yüan kuei, et une note très courte du Lo yáu hua mu hi
洛陽花木記 ("Mémoires des plantes de Lo-yáng"), écrit par Con Sū 周叙
dans la seconde moitié de l'onzième siècle. Le texte le plus important du Lii 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


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 membrables, trouvées en Grèce, Asie, Inde, etc., fol. 369 (Anvers, 1555) [cf. T'oung Pao, 1916, p. 382]: "Les Turcs ont des merveilleuses expériences 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'Apotiques) auquel demandent pour demie aspre de la semence de Tatoula. Puis la baillent à celuy qui ne peut dormir. Tatoula n'est autre chose que ce que les Arabes appellent Naṭ metel, et les Grècs Solanum somniferum: de laquelle nous en trouvassmes de sauvage en la plaine de l'eriche, près la fontaine d'Hélisee." Le mot tatoula est Osmanli dadula طاطولا (néo-grec τάτουλα), 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. Christoval Acosta (Tractado de las drogas y medicinas de las Indias Orientales, p. 87, Burgos, 1576) s'exprime ainsi: "Lhamasa esta planta en el Malabar, Vomata [Sanskrit ummatā] caya: en Canarín, Daluyo: los Arabes, Naṭ metel, y Marana: los Portugueses, Datura, y la Burladora: los Parasios, y Turcos, Datula: los medicos Indios no se conocen esta planta prima, cuel grado tercero, y seca cuel 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, C₁₇H₂₅O₂. 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. Crawfurd⁴ nous informe que kučubuň (le mot soundanais pour Datura ferox) 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 poisons.⁵ La désignation propre de la dernière espèce est náo-yaň 閒羊; d'autre 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.⁶


¹ History of the Indian Archipelago, I, p. 466.
² Javaanse kašūkun, malais kašūkun. D'après l'Encyclopædie van Nederlandch-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 Hoibow mui-two-lo 閒山羅, évidemment une tentative dialectale de reproduire le mot étranger mān-t'o-lo. Forbes et Hemastle (Journal Linncean Society, XXVI, p. 175) disent que Datura alba se trouve dans la Chine méridionale et à Formose, et est cultivée à Péking.
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, 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, dépimiées 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'hydroisie.” En effet, plusieurs espèces de *Datura* (*fastuosa, metel*, et *stramonium*) croissent dans l'Inde.  

C'est dans l'Inde que nous rencontrons aussi le prototype des brigands de Cou K'ü-fei. Nous savons par Garcia da Orta (1563) que les thugs indiens mettaient cette drogue dans leur 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 parler très peu, et seulement des absurdités. 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 anesthetic. It is used in infusion to wash the foot; 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.

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 mixture, 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 Auréel 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-

blable à celui de Frontin à propos du général carthaginien Himilco.

Mais retournons à l'Inde. La connaissance du dhattū́ra y remonte à une époque reculée, car la plante est plusieurs fois mentionnée par Suśruta. Je dois à l'obligeance du Dr. A. F. R. Hoernle d'Oxford les renseignements suivants:

"There are the following references to dhattū́ra in the text-book of Suśruta:—

1. Cikitśasthā́na, ch. XVII, verse 35, p. 435 (Jivinanda, 5th ed.), where pounded seeds of dhattū́ra and other drugs (madana, kodraca, etc.) are recommended in the treatment of a sinus (nā́di).

2. Kalpasū́trā, ch. VI, verse 49, p. 589, roots (or, according to others, seeds) of dhattū́ra, made up, with other drugs, into a paste, is recommended as a cīrovīreanca (‘clearing of the head’) in the case of hydrophobia.

3. Ibidem, verses 51, 52, root of dhattū́ra, made, with other drugs, into a paste, wrapped in leaves of unmattaka (synonyme of dhattū́ra), and baked into a cake (apāpaka), is recommended in the case of bite by a rabid dog.

"In the text-book of Caraka, dhattū́ra does not occur at all. For the occurrence of dhattū́ra in medical text-books and later authors, such as Cakrapā́ṇidatta, c. A.D. 1060, and Bhāva Miśra (Bhāvaprakāśa), 16. cent. A.D., see U. C. Dutt's Materia Medica, pp. 207—8.

"The Sanskrit word is spelled variously dhattū́ra, dhuttū́ra, dhūṣṭū́ra, etc.

"You identify dhattū́ra 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, dhattū́ra and unmatta (or unmattaka). The former is expressly called kṛṣṇa-puspā, 'dark-flowered' (see Rāja Nighaṇṭu, 10. varga, p. 135), and appears to be the one usually intended to
be used. But *unnatta* seems to be the proper name of the white variety; indicated by a prescription of Cakrapāṇida (\textit{Mat. Med.}, p. 207, note 2), where the name *puetonmatta*, or 'white dhattāra' occurs. \textit{D. stramonium} has white flowers, while \textit{D. metel} and \textit{D. fastuosa} have darker flowers. Accordingly the Sanskrit name *dhattāra* would seem to refer to the latter two varieties, while *unnatta* would seem to indicate the variety \textit{D. stramonium}.

The Dr. T. Tanaka au Bureau of Plant Industry, Department of Agriculture, Washington, a eu l'extrême obligation de traduire pour moi les renseignements suivants sur \textit{Mandara-hua} (ou \textit{Mandara-ya} selon la prononciation bouddhiste) \mantra, contenus dans le \textit{Benzo-komoku-keimō} 本草綱目啓蒙 by Ono Hanran 小野蘭山 (revue par Igo Chi Boi 井口望之, 1847, chap. 13, p. 28–39):

\textit{Japanese Nomenclature}:

<table>
<thead>
<tr>
<th>Korean morning glory</th>
<th>In Provinces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cūsen-asagao</td>
<td>Iyo.</td>
</tr>
<tr>
<td>Yama-nasubi</td>
<td>Iyo.</td>
</tr>
<tr>
<td>Namban-asagao</td>
<td>Sanuki.</td>
</tr>
<tr>
<td>Hari-nasubi</td>
<td>Hoki, Iwami, Iyo.</td>
</tr>
<tr>
<td>Tō-nasubi</td>
<td>Awa.</td>
</tr>
<tr>
<td>Gekwa-koroi</td>
<td>Awa.</td>
</tr>
<tr>
<td>Gekwa-demai</td>
<td>Buzen.</td>
</tr>
<tr>
<td>Temjiku-nasubi</td>
<td>Edo (Tokyo).</td>
</tr>
<tr>
<td>Iya-nasubi</td>
<td>Iwami.</td>
</tr>
<tr>
<td>Gība-ūo</td>
<td>Bingo.</td>
</tr>
<tr>
<td>Ĉambera-ōo</td>
<td>Nagato.</td>
</tr>
<tr>
<td>Kiūgai-nasubi</td>
<td>Simoosa.</td>
</tr>
<tr>
<td>Amisu</td>
<td>Totomi.</td>
</tr>
<tr>
<td>Iya-nam</td>
<td></td>
</tr>
<tr>
<td>Ki-asagao</td>
<td></td>
</tr>
<tr>
<td>Ĉisen-tabako</td>
<td></td>
</tr>
<tr>
<td>Tō-asagao</td>
<td></td>
</tr>
<tr>
<td>Baramon-ōo</td>
<td></td>
</tr>
</tbody>
</table>

\textit{Chinese synonyms}:

\begin{align*}
\text{佛花} & \quad \text{Fu hua ('Buddha's flower')}. \\
\text{顙茄} & \quad \text{Tien chi}. \\
\text{悶陀羅草} & \quad \text{Men t'o lo t'en}. \\
\text{天茄彌陀花} & \quad \text{T'en t'ie mi t'o hua}. \\
\end{align*}

"Spontaneous in the provinces Hoki, Buzen, and Sawa, 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_, _mandâra_ ou _mandâraka_ signifient en premier lieu _Erythrina indica_, l'arbre de corail, un des cinq arbres du ciel d'Indra, appelé aussi _parijâta_, puis une variété blanche de _Calotropis gigantea_, et enfin la pomme épineuse, c'est-à-dire le genre _Datura_. À 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_. D'autre part, l'usage du mot _mandara_ chez _Cou K'ü-fei_ à l'époque des Song prouve assez bien que dans l'Inde aussi _mandara_ servait d'expression pour le _Datura_.

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near Kyoto. 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 mm ( _1 mm = 0.039 inch_ ) long. Fruit, about 1 mm long, is round and spiny, hence the name _hari-mawadi_ 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. 146) dit à ce sujet, C'est d'ailleurs Li Ši-ten 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 hua hui_ (Saddharmapundarika-utra) 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 mandaraka 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.